NORTHERN ROCKY MOUNTAIN

TREES AND SHRUBS

J. E. KIRKWOOD

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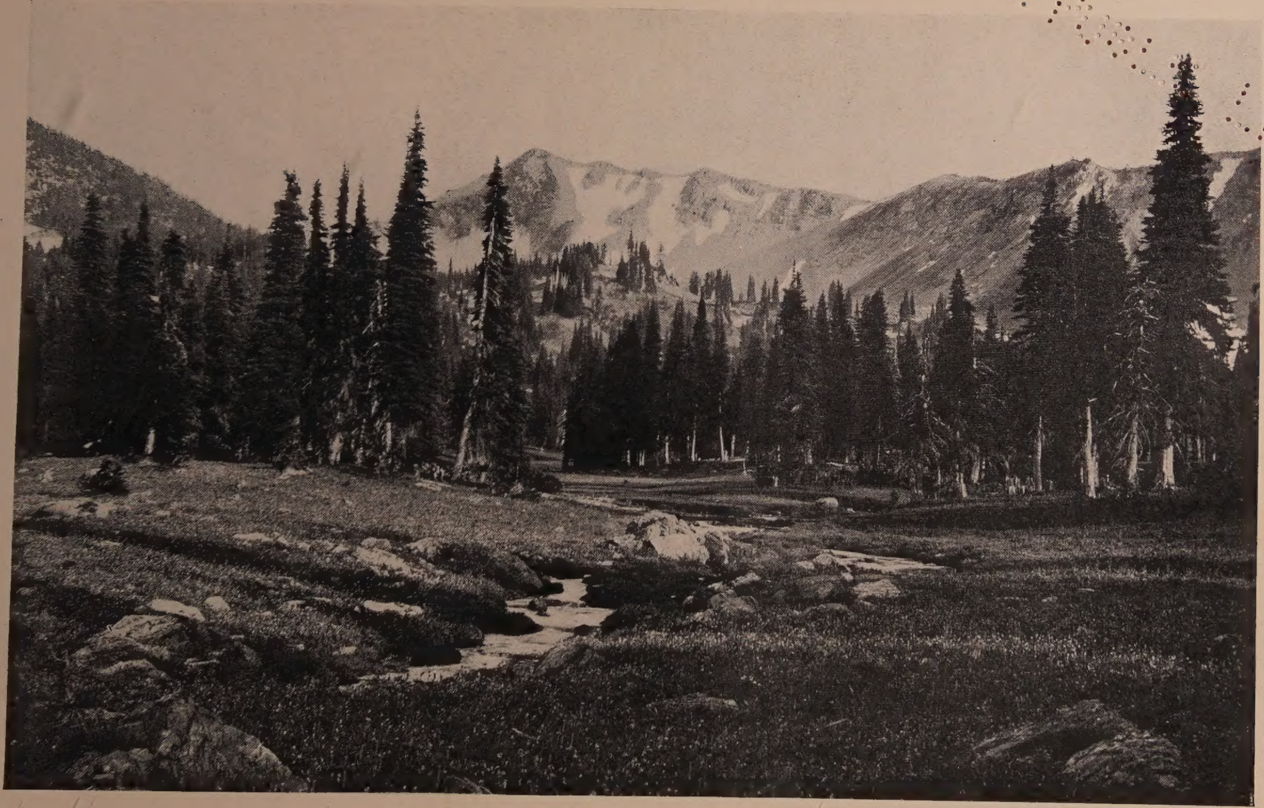

PLATE 1 (p. 38)

Alpine fir in the Swan Mountains

Abies lasiocarpa (Hook.) Nutt.

Northern Rocky Mountain
TREES AND SHRUBS

By

J. E. KIRKWOOD, PH. D.

Late Professor of Botany in the State University of Montana

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1930

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JOSEPH EDWARD KIRKWOOD

Dr. Joseph Edward Kirkwood passed suddenly from this life on August 16, 1928, while at work at the Biological Station at Flathead Lake, Montana. With others, he was engaged in a problem dealing with the fish and fish food of the lake, a problem undertaken jointly by the State University of Montana and the Montana State Fish and Game Commission. He was retiring after the day's work when the attack came suddenly and without warning. Fifty-six years old at the time of his death, and apparently in perfect health and vigor, he seemed to have assurance of many years in which to complete his numerous projects for work on botanical problems in the relatively virgin field of the Northwest. By his untimely death the botanically rich region in which he lived has lost one of its ablest and most persistent explorers and investigators.

Joseph E. Kirkwood was born at Cedar Rapids, Iowa, January 24, 1872, and when he was a boy of twelve his parents moved from Iowa to Oregon, to seek fortune in the wilderness of the Willamette Valley. Very trying conditions during his early youth, together with a desperate struggle to secure an education, developed in him a type of courage and persistence which enabled him to overcome obstacles which to others would have seemed insurmountable.

His marriage to Ella Belinda Hoyt occurred in 1901, three years after receiving his academic degree from Pacific University, and she was with him when the end came so unexpectedly at Flathead Lake. There are three children, Robert Hoyt, Mary Burnette, and Edward Russell, all born while Dr. Kirkwood was Professor of Botany at Syracuse University.

After receiving his Doctor's degree from Columbia University in 1903 he was appointed Associate Professor of Botany in Syracuse University, where he worked until 1907, in the latter year being made full professor and head of his department. One year was spent in Mexico in investigations for the Continental Mexican Rubber Company, a rather disastrous venture for him financially. Following this he spent a year in research work with the Desert Botanical Laboratory at Tucson, Arizona, and came to the University of Montana in 1909, where he continued in service until his death.

Dr. Kirkwood came to the State University of Montana as Assistant Professor of Botany and Forestry; from 1910 to 1914 he was Professor of Botany and Forestry; and from 1914 on was head of the Department of Botany. As chairman of the Scholarship Committee, chairman of the Graduate Study Committee, and as a member of the Research Committee, he did much to build up the State University of Montana. Not only to his colleagues but to his students as well he continually urged the necessity of research as a part of the university educational program.

At the University of Montana he prepared a large herbarium from his own collecting and from exchange, and presented to students a fine example of serious study and desire for research. In testimony of their appreciation of his work the students of forestry brought a huge boulder from the rugged mountains, placed it in a suitable place in the young forest nursery, and on its face cemented a suitably engraved bronze tablet. Thus will his memory ever be preserved on the campus.

From the time of his graduation at Pacific University to the fateful day when, among the lovely forest trees which were his joy and pride, and also his life work, his labors were so abruptly terminated, a period of thirty years, all of his abundant energy was devoted to the carrying of a heavy teaching load and to the general promotion of the study of botany. This book, almost the last work on which he was engaged, commanded his leisure time for years. Its publication as a memorial volume was undertaken by his colleagues at Montana State University and Mrs. Kirkwood, through a plan proposed by President Charles H. Clapp. A subsidy appropriated by the State Board of Education made the publication possible. This work is a valuable contribution to botany and forestry in the Northwest, and will doubtless be a starting-point for many students of coming years, including some who received their first inspiration from his teaching and experience.

Through this volume his work will be in part transmitted to many who did not know him. But his enduring monument, aside from his many published contributions, is the great work he has wrought in the hearts of men and women during his teaching life of a third of a century.

He was genial and companionable, a splendid field worker, and a great lover of Nature. His colleagues, some of whom have been closely associated with him for more than a quarter of a century, consider it a rare privilege to have had through so many years the friendship of a man of such noble impulses, humane sympathy, interest in students, and devotion to his work, as Joseph E. Kirkwood.

Morton J. Elrod
Professor of Biology

University of Montana

PREFACE

The present volume has been prepared to meet the need for a book on the trees and shrubs of the northern Rocky Mountains which will be of service in the hands of those not technically trained as botanists yet whose interest, vocational or otherwise, brings them into contact with the forest vegetation. To foresters, lumbermen, woodsmen, farmers, to teachers and pupils in the schools, to students in college, and to all whose interest in nature takes them out of doors, the accompanying pages are offered. While primarily designed for the use of the general public, the book has been so planned as to serve also the technical botanist interested in the flora from either the systematic or the ecological standpoint.

It is not expected that the recognition accorded to some species or denied to others will meet with unanimous approval at the hands of critics. That would not be possible whatever the position taken. The attempt has been to bring together the facts as at present known concerning the woody portion of the flora, and, where difference of opinion obtains, to adopt a conservative view, without presuming to settle the points at issue. This treatment is therefore not to be viewed as a research on the validity of every species described or on any one of them, but as a discussion of the trees and shrubs most generally conceded as growing within the area indicated. Some space is nevertheless given to the history of the species and the conceptions held regarding them by other writers past and present.

The geographic region embraced in the title, "Northern Rocky Mountains," includes the country from the Yellowstone Park north and northwest through Montana and Idaho and the Canadian Rockies, and covers the various ranges and the immediately adjacent plains. It is intended to include all trees and shrubs known to grow without cultivation within the area.

The specific descriptions have been written in nearly every case directly from the material, with careful comparison of published descriptions and reference to the field notes of the author. While employing a minimum of technical terms, the accounts give as full attention as possible to essential detail. Illustrations in most cases are original, made from the plants described and presenting in detail the characters of each genus. Photographic reproductions show features of habit and environment, or details of particular species.

In treating the geographic range of a species the facts of its general distribution are given and a few localities where it is known to occur within the region are mentioned. Outstanding facts of biological importance and utility also receive attention.

In discussing families and genera it is deemed important that some information should be given about the character of the groups as a whole, their distribution, and their relation to the species which they embrace. Some consideration is also given to the biological characteristics of each group and to its economic importance in human affairs.

The writer desires to acknowledge with thanks his obligation to the Department of Botany of the University of California for the privileges accorded in free use of library and collections; to Professor W. L. Jepson of that university and to Dr. H. M. Hall of the Carnegie Institution of Washington for valuable criticisms and suggestions; to Dr. Aven Nelson for reading the manuscript; to Professor C. S. Sargent for the identification of part of the material employed; and to all the others whose courtesy and kindness made possible the prosecution of this work. Acknowledgment should also be made to the State University of Montana for the opportunity afforded by sabbatical leave, during which the first draft of this book was prepared.

J. E. Kirkwood

Missoula, Montana
March 1928

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TREES AND SHRUBS OF THE NORTHERN ROCKY MOUNTAINS

INTRODUCTION

One may view the vegetation of his environment from one or more of several standpoints, including the aesthetic, the utilitarian, and the scientific. Doubtless few are wholly indifferent to plant life in flower and leaf, to the forest at all times, and to the prairies, meadows, swamps, and deserts in season, rich in color and in the multitudinous forms of life which appeal to us in varying degrees, from the mere sense of recreative satisfaction to the fuller appreciation of the artistic settings which a landscape may afford. The economic point of view may suggest values in board feet and in grazing, water conservation, or other interests. To the botanist all of these appeals may come with more or less force; but in addition he sees, what the others may not, the relationships of the plants as indicated by form and structure, their differing relations to soil, moisture, and light and their competitive struggles for advantage in the possession of these factors, their distribution as related to topography and climate, their varied devices for propagation and dispersal, whence they came and how they arrived, and the place which they hold in the vegetation of the region and the world. All these, even if not fully ascertainable, may at least invite his interest and study.

Before identifying the woody plants of the northern Rocky Mountains it may be well to consider some of the salient features presented by the vegetation of the region, and to inquire as to the sources from which it has been derived.

The region is one of great topographic diversity, of wide differences in altitude, of varied exposure, acclivity, and soil. In parts at least of this area the topographic control of vegetation is emphatic, owing partly to the limited rainfall and its seasonal distribution in connection with the exposure and structure of the soil, and also partly to the differences in temperature occasioned by differences in exposure.

The main and secondary mountain ranges lie athwart the direction of rain-bearing winds and separate areas climatically different. The western slope of the Continental Divide, with its parallel ranges and inter-mountain valleys, has the dry summers, the winter rains and snows, and the more moderate temperatures characteristic of the Pacific Northwest, while the eastern slope has the summer rains and the drier and colder winters of the Mississippi Valley. The total precipitation, however, decreases eastward from the coast, and the forest vegetation likewise decreases in area, in volume, and in species. The saturated winds from the Pacific, giving toll first to the Coast Range and then to the Cascades, expanding over the broad basin of eastern Oregon and Washington, contribute again of their stores to the western slopes of the Bitterroots, Coeur d'Alenes, Cabinets, and Selkirks, expand once more over the valleys eastward, and finally yield their last tribute to the main range of the Rockies.

The western slopes of the high mountains intercepting these winds are the most heavily forested, while the eastern sides are sparsely clothed with the more drouth-resistant species. The lower western and southern slopes, however, are usually grassy and often without trees and shrubs. The same is true of wide stretches of inter-mountain valleys, except along the river bottoms, which are given over more or less to cottonwoods and willows, birch and alder, and many other broad-leaved deciduous trees and shrubs. The general character of the river-bottom vegetation is constant for all sections, whether in the wide plains of the low eastern slope or in the forested valleys of the Clark Fork and other tributaries of the Columbia drainage, for the general reason that the bottom lands provide a perennially sufficient supply of available water, which the uplands often fail to do.

The uplands bear mainly coniferous evergreen species, and frequently present sharp contrasts in local distribution. Treeless valleys often afford wide vistas of landscape, including distant foothills where a long series of southern slopes are bare while their alternating northern exposures are forested. Such conditions find their most reasonable explanation in the differing amounts of available soil moisture, conserved on the northern aspect by diminished evaporation, but dissipated on the southern by long exposure to the almost perpendicular rays of the sun during the rainless summer months. Alternations of this sort are more or less common, though the species concerned may be different and the directions of the successive exposures may vary.

On a larger scale the differentiation of prairie and forest areas in the Rocky Mountains and adjacent slopes can be related to the amount of moisture available. The prairies on the eastern slope of the Divide, while receiving most of their rain in the growing season, have a low total, 12 to 16 inches in most places, and are subject to desiccating winds; on the western slope, while the total precipitation of the year may vary locally from 11 inches to 24 inches, the summers are mostly dry and the soil is often thin and underlaid by deep gravels, only sufficiently retentive of moisture to support a prairie vegetation, which runs its active course in the early part of the season and subsides with the advent of summer's drouth. Above certain altitudes, which vary with the geographic position, the prairies seldom extend and the forests are continuous and ample, owing to the higher relative humidity and its consequences upon precipitation and evaporation. As to this feature, temperature also is important, in relation both to the water supply and to the peculiar requirements of the species.

From latitude 45°N., about the southern boundary of Montana, northward to the Arctic Circle there obtains a wide range of thermal conditions and a corresponding diversity in the plant life. These conditions are differentiated not only according to latitude, but also according to altitude, from levels of 2,000 to those of nearly 13,000 feet. The effects of temperature upon the vegetation of the region are felt in various ways: in the length of the growing season and of the frostless period; in the cumulative effect of the maximum daily temperatures of the growing season and also the minimum temperatures and duration of winter. As the various species are susceptible in different degrees to the length or intensity of the temperatures above or below the line of 40° F., which marks the border line between the active and the dormant condition of plant life, or between the growing and non-growing seasons, we find their distribution in latitude determined by isotherms and altitudes. There is a definite limit northward beyond which forest vegetation does not extend; and a similar bound is set by altitude on mountain peaks where otherwise different conditions prevail. Thus, at the timber line on mountains at lower latitudes wide diurnal variations in temperature occur during the growing season; these variations gradually diminish northward as the day lengthens until they merge with the seasonal variations at the Pole. In the northern Rocky Mountains there is no definite timber line due to altitude. Some of the highest peaks are timbered to their summits, while others much lower are bare; the controlling factors seem to be soil and exposure, in which the steepness of the slopes and the direction and force of winds are most influential.

In the southern part of the region under discussion the forests are continuous only above 5,000 to 6,000 feet, and extend to the summit of the Continental Divide at 7,000 feet and over. Northward they gradually descend, especially on northern slopes, to 1,800 feet or less, and fill many narrow valleys. Between latitudes 45° and 50° N. the main body of the forest is at middle elevations, between 4,000 and 6,000 feet; below this the forests are broken by prairies; above they diminish to the scrub forms approaching the alpine crests. The mountain forest is dominantly evergreen, coniferous, and consists chiefly of pine, larch, spruce, and fir, with a liberal intermixture of shrubs of various families and genera.

There is in the northern Rocky Mountains a distinct overlapping of different floras. The northern boreal flora extends southward mostly along the higher elevations, and some of its constituents range far beyond the limits of the present treatment. From the southern Rocky Mountains and the Great Basin are northward-ranging species at lower levels. The flora of the Mississippi Valley ascends the eastern slope of the Divide, and many of its species reach beyond the barrier; while from the west a large representation of Pacific Coast forms mingle with them, and some reach far beyond to the Plains and even to the Great Lakes.

The northern Rockies have a composite flora, not only with reference to forests but also in the lesser vegetation. All, or at least most of the species have migrated into the area during long periods of time. To get a better idea of what this means it is necessary to review some of the earlier conditions.

This vegetation, like that of all other parts of the earth, has been subject to periodic change and influence in relation to geology. At one time, in the early Cretaceous period, a continuous forest of conifers and cycads covered the North American continent. In the late Cretaceous the land became divided by an arm of the sea which extended north from the Gulf to the Arctic, through what is now Montana. During this period probably occurred the beginning of the marked differentation of the Eastern flora from that of the West. In the East are elm, hickory, chestnut, sassafras, tulip, Osage orange, and magnolia, which are not found native on the Pacific Coast; in the West are sequoias, chinquapin, madrone, and other trees which do not occur east of the Rocky Mountains. Oaks are on both coasts, but not the same species of oaks; the same is true to a large extent of maples, alders, pines, firs, and many others. Toward the close of the Cretaceous there entered many hardwood types of modern form. The eastern slope of the Rockies was more humid in the Cretaceous and the Tertiary than now, as one may judge by the remains of petrified forests scattered from Montana to Arizona, and by the fossils of holly, oak, chestnut, sequoia, and other trees scattered throughout the region. In fact, of the fifty or more genera of the plants known as hardwoods (angiosperms) whose fossil remains appear north of the southern boundary of Montana, nearly all are represented by one or more species within the temperate latitudes of North America, and the majority of the genera of like sort now growing there are found also among the fossils. Of the softwoods (gymnosperms) of the Tertiary, three-fourths are now likewise native to temperate North America. The rich flora of the Tertiary, abounding in the broad-leaved, deciduous forests, must have developed under conditions far different from any that have obtained since, both as to temperature and moisture, and doubtless far more favorable to the origin of new forms. In this period the East and the West were again united by land. But it was an age of successive uplifts and depressions. Areas became submerged and their forests destroyed. Other areas were subjected to severe changes locally. Erosion and other disturbances must have modified greatly the character, proportions, and distribution of the species.

With the advent of the glacial period great fields of ice pushed southward, carrying destruction to the forests. Either the main or the smaller ice-sheets covered nearly the whole region, which today bears abundant evidence of their extent and activity. The glaciers swept all before them, and doubtless the modifications of climate during this period were so profound as to affect all vegetation within a considerable radius and to effect a southward displacement of the arctic and the temperate zones of vegetation. With the final recession of the ice, plant life re-occupied the ground in successive waves. First, the boreal plants, driven by the rising temperatures, followed close upon the retreating glaciers; in the hollows were lakes and ponds, which were soon occupied by aquatics and were ultimately supplanted in many cases by peat bogs and their characteristic flora; finally came the conifers and hardwoods to renew the forests.

As to the sources from which the species now occupying the land have been derived, several possibilities exist. While there is little direct evidence connecting them with the pre-glacial, Tertiary flora, it is not impossible that some have been derived from plants of that period, in the course of evolution, during the times of their southward and subsequent northward migrations. We may, however, with a fair degree of certainty relate many of the existing members of the northern Rocky Mountain flora to several main geographic regions from which they seem to have arrived since glacial times.

First are those trees and shrubs which have come from the north. Across the continent northward is a broad zone of forest vegetation, consisting of spruce, fir, larch, juniper, cottonwood, willow, alder, birch, heath, and many others. Preferring cool temperatures and moist conditions, they extend from the Canadian Atlantic provinces, around the Great Lakes, and northwestward through the region watered by numerous lakes and rivers, and across the Rocky Mountains to Alaska and the shores of the Pacific. The similar conditions afforded by high altitudes along the mountain ranges have opened a highway southward and have populated the Rocky Mountains with many of these species. In their migrations from the north some have moved much farther than others, their number decreasing with distance. The following may be included in this category: Common and Creeping Junipers, Aspen, Balsam, Cottonwood, White Spruce, several willows, Paper Birch, Swamp and Hudson Bay Currants, Mountain Ash, Shrubby Cinquefoil, Canadian Buffalo Berry, Scarlet Sumac, Alder-leaved Buckthorn, Dogwood, Andromeda, Kinnikinnick and several other Heaths, several Huckleberries, Red-berried Elder, Husk-Honeysuckle, and others.

From the south, on the other hand, the northern Rocky Mountains receive, chiefly from the Great Basin, a few well-marked forms. They are mostly plants of comparatively dry, alkaline, or semi-desert conditions, favoring the lower altitudes and warmer localities, and for the most part scarcely reaching beyond the 49th parallel of latitude. Among these the most conspicuous are Spanish Bayonet and all the Cacti within the area, Salt Bush, White Sage, Greasewood, Fendler's Rose, Mountain Mahoganies, Purshia, Sharp-leaved Gilia, Southern Elder, and probably all the members of the shrubby composites in our flora.

The rich and ancient flora of the Appalachian Mountains is regarded as a center of distribution from which lines of migration have extended north and west and southwest. The westward movement of many arborescent species is checked at the Great Plains, whose arid conditions furnish an impassable barrier, while others following the Missouri and other streams have found sufficient moisture to maintain and extend their sway where otherwise this would have been impossible. Some of the species reaching northward to Hudson Bay, and thence westward to the Rocky Mountains and the Pacific Coast, have found a convenient opportunity for southward migration along the Rocky Mountains, and so have entered our region by that roundabout course, which was also more favorable, doubtless, for those best adapted to cooler climates. It has been pointed out that those species having seeds most easily carried by the wind have traveled farthest to the northwest. Among those apparently entering our range from the east are the following: Western and Narrow-leaved Cottonwoods, Peach-leaved and a few other willows, American or Black Currant, Wild Plum, Box Elder, Canadian Elder, Coralberry, and others.

Doubtless the largest contribution to the flora of the northern Rockies comes from the west. The great number of species common to the Rocky Mountains and the Pacific Northwest alone suggests this, but additional facts make it still more evident. In the first place, the climatic condition of the western slope of the Rockies is similar to that of the neighboring coast, although modified in the degrees of its various factors by distance. The precipitation, although diminished, has the same seasonal distribution. The winter temperatures are lower and those of summer are higher, except where modified by altitude, a factor which also affects the length of the growing season. The direction of the winds is much the same. In many of the sheltered valleys of the northern Rockies conditions are locally intensified in humidity and rainfall and the temperature is so moderate as to supply conditions very similar to those of western Oregon and Washington. In such localities one is sure to find a flora in many respects also similar; the Grand Fir, Western Hemlock, Arbor Vitae, Western Yew, Cascara, Ocean Spray, Thimbleberry, Salmonberry, and many other woody plants, besides numerous herbs, mosses, fungi, etc., strongly recall the forests of the humid coast belt. The number of these plants, both species and individuals, varies inversely with the distance eastward, when the whole area is taken into account.

The movement of the coastal flora eastward is favored in several ways. The direction of the prevailing winds is mainly from the southwest, and it may be noted that of all the Pacific Northwestern plants in the northern Rockies none are heavy-seeded; their seeds are such as may be transported readily by the wind, or are likely to be sought by animals as food. Nearly half of the trees and shrubs listed as coming from the Northwest have seeds winged or otherwise fitted for wind-dispersal; about one-third bear succulent fruits with small seeds, berries, and the like, which are likely to be carried by birds. The rest bear minute seeds without special buoyant devices.

The country between the Cascades and the Rockies is a broad and comparatively arid basin, unsuited to plants of the humid coast belt, and presenting a barrier not easily traversed by them. It may not, however, always have been so, and it is altogether likely that at some time subsequent to the glacial age this region offered conditions far more favorable for the life and movements of arborescent species than it now affords. But it is still possible that migrations of the plants in question may take place through the country north of the Columbia Basin, where the Okanogan country and the Selkirks in part bridge the gap.

The contributions to the Rocky Mountain flora from the Pacific Northwest seem to include most of our coniferous species, about a dozen willows, Black Cottonwood, Western and Alaskan Birches, Thin-leaved Alder, Oregon Grape, Syringa, the Spiraeas, Ocean Spray, Thimbleberry, Salmonberry, the Nootka and Bare-fruited roses, Western Service Berry, Douglas Thorn, two Chokecherries, Mountain Lover, Poison Oak, Mountain Balm, Devil's Club, Flowering Dogwood, several heaths, huckleberries, and others.

Some of these are very common throughout the mountains; others are closely restricted to the most humid localities or to alpine situations.

While many species from the East and the West have crossed the main ridge of the Rockies and extend their ranges to greater or less distance on either side, still the Rocky Mountains stand as a barrier against the eastward or westward movements of species. The effectiveness of this barrier is due not so much to the elevation of the main divide, which rises from 5,000 to 10,000 feet, as to the mass elevation of the region, which includes a belt three hundred miles or more in width from east to west. This belt is occupied by parallel and intersecting ranges of similar altitude, imparting to their valleys of 2,000 to 5,000 feet much of the climatic rigors belonging to their own elevated crests. The conditions of rainfall, humidity, and temperature, the length of the frostless and the growing seasons, and the specific requirements of each species interact to determine its range and prevalence. The ranges of the species, as well as their particular requirements, are at present known only in the most general way. There is much need of further observation and study concerning them.

The woody flora of the northern Rocky Mountains within the area defined is included in 27 families, 79 genera, and about 248 species. Of these, 2 families, 9 genera, and 24 species are gymnosperms, mainly coniferous, softwoods, and compose the bulk of the great forests of pine, larch, spruce, Douglas spruce, hemlock, fir, arbor vitae, and yew—the dominant vegetation of the whole region, though constituting less than one-tenth of the species. The rest are angiosperms, hardwoods, far less in volume but greatly exceeding the conifers in number of species, which are distributed through the different families according to the following table:

Family	Genera	Species
Pine	8	23
Yew	1	1
Lily	1	1
Willow	2	51
Birch	3	10
Goosefoot	4	6
Crowfoot	2	2
Barberry	1	2

Family	Genera	Species
Hydrangea	1	1
Gooseberry	1	16
Rose	13	31
Apple	3	11
Plum	1	5
Staff tree	3	3
Sumac	1	3
Maple	1	3
Buckthorn	2	5
Cactus	2	4
Oleaster	2	3
Ginseng	1	1
Dogwood	1	1
Heath	11	20
Huckleberry	2	11
Phlox	1	1
Figwort	1	1
Honeysuckle	6	18
Composite	4	14
Total	79	248

It will be observed that over one hundred of the species are in three families (Willow, Rose, and Heath) and that over fifty are in the Willow Family alone. Sixteen of the families have less than ten species each, and six are represented by but one each. Most of the members of this group are shrubs, some of them small and inconspicuous. As a rule in this region large trees are formed only in the cottonwoods of the Willow Family, although some of the willows, birches, alders, hawthorns, and a few others may, under exceptional conditions, attain the form and dimensions of trees.

The term hardwood is used to denote the broad-leaved, woody species of that division of the seed plants known as angiosperms. In the temperate latitudes of North America this would mean the broad-leaved woody plants in distinction to the needle or scale-leaved cone-bearing species commonly called conifers and botanically known as gymnosperms. The scientific terms are the only ones really expressing the difference between the groups, a difference which is very fundamental and important, referring to structural features, gymnosperms meaning "naked seeds" and angiosperms "covered seeds." This distinction is more fully brought out elsewhere. The distinction on the basis of wood-hardness is after all fictitious, inasmuch as many of the so-called softwoods (Douglas Spruce, tamaracks, certain pines, etc.) have much harder wood than some of those designated as hardwoods (cottonwoods, willows). Of the hardwoods, however, the oaks, maples, hickories, and many others justify the term. The terms "evergreen" and "deciduous" sometimes used to distinguish between these groups, have no significance for the purpose. Both angiosperms and gymnosperms have deciduous and evergreen members, as in the case of the deciduous and "live" or evergreen oaks in the former, and the tamaracks, pines, firs, and others in the latter. In this treatment, however, the term hardwood will be used to include the angiosperms in the commonly accepted sense.

KEY TO THE FAMILIES

The following key applies only to the woody members of the families found in the region treated. The numbers indicate systematic sequence.

- Ovules and seeds borne on the surface of an open scale
  - Fruit a cone, dry or fleshy.................. 1. *Pinaceae*
  - Fruit a seed with a pink, fleshy collar......... 2. *Taxaceae*
- Ovules and seeds borne in a closed ovary
  - Leaves parallel-veined .... 3. *Liliaceae*
  - Leaves netted-veined
    - Calyx and corolla both absent............. 4. *Salicaceae*
    - Calyx only present
      - Flowers very small, green or yellow
        - Staminate flowers in catkins....... 5. *Betulaceae*
        - Staminate flowers not in catkins.... 6. *Chenopodiaceae*
      - Flowers large, white or purple......... 7. *Ranunculaceae*
    - Calyx and corolla both present (except 19 and some in 17)
      - Corolla of separate petals
        - Fruit dry, or the receptacle fleshy
          - Fruit of separate carpels........ 11. *Rosaceae*
          - Fruit of united carpels
            - Flowers large, white......... 9. *Hydrangeaceae*
            - Flowers small, greenish
              - Fruit a capsule
                - Leaves mostly opposite 14. *Celastraceae*
                - Leaves alternate ...... 17. *Rhamnaceae*
              - Fruit of two-winged carpels 16. *Aceraceae*
        - Fruit more or less fleshy
          - Fruit a berry
            - Stems leafy and woody
              - Leaves compound, evergreen .... 8. *Berberidaceae*
              - Leaves simple, deciduous.. 10. *Grossulariaceae*
            - Stems fleshy, leafless........ 18. *Cactaceae*
          - Fruit not a berry
            - Fruit apple-like .... 12. *Pomaceae*
            - Fruit a drupe
              - Stone 1-celled
                - Leaves entire .... 13. *Drupaceae*
                - Leaves compound ..... 15. *Anacardiaceae*
              - Stone more than 1-celled
                - Stems not spiny
                  - Flowers on plan of 3 to 5.......... 17. *Rhamnaceae*

- Flowers on plan of 4
  - Twigs scaly-pubescent ..... 19. *Elaeagnaceae*
  - Twigs not scaly-pubescent ... 21. *Cornaceae*
- Stems spiny .... 20. *Araliaceae*

- Corolla of united petals
  - Ovary superior
    - Flowers mostly regular
      - Leaves simple, not pungent... 22. *Ericaceae*
      - Leaves divided, sharp-pointed 24. *Polemoniaceae*
    - Flowers irregular .... 25. *Scrophulariaceae*
  - Ovary inferior
    - Fruit fleshy
      - Leaves alternate .... 23. *Vacciniaceae*
      - Leaves opposite .... 26. *Caprifoliaceae*
    - Fruit dry .... 27. *Compositae*

PRONUNCIATION OF SCIENTIFIC NAMES

As an aid to the pronunciation of scientific names the accented syllable has been marked. When the vowel of the accented syllable is short the acute (′) accent is used; when the vowel is long or broad the grave (`) accent is used.

A brief treatise on botanical terms, their meaning and use, will be found in the Appendix, pages 321 ff.

PINÀCEAE

Pine Family

All members of the Pine Family are either trees or shrubs, varying from low creeping forms to the largest forest trees. The usual arborescent type is characterized by a straight central shaft bearing lateral branches, which give frequently a pyramidal, or spire-like, form to the crown. Most species of the group are evergreen, with hard-surfaced leaves, either needle-like or scale-like in form. The flowers, which appear early in the season, consist of a central axis, upon which are closely arranged scale-like structures in spiral or cyclic order. The male or pollen flowers vary from ⅛ inch to 2 inches in length and bear on the lower surface of each scale two or more minute sacs in which the pollen is produced. After the pollen is shed these flowers usually drop off, though they may often be found in withered condition clinging to the branch. The female or ovulate flowers bear two series of lateral members instead of one: one series, called the scales, bear the potential seeds upon their upper surfaces and later produce the principal tissue of the cone; the other series, that of the bracts, are characterized by a bract situated below each scale. In the earlier condition of the cone the bracts are usually conspicuous and surpass the scales, but later the scales outgrow the bracts and in the majority of cases conceal them. The ovulate flowers are much less numerous and conspicuous than the others, though in most cases both are small and hardly noticeable. In the flowering condition the ovules are borne fully exposed to direct contact with the pollen, later the scales close together during the period of development of the seeds and, in the majority of cases, are again spread apart at maturity to liberate the ripened seeds, which are often provided with a thin, membranous, wing-like appendage in the interest of their dispersal by wind. The seeds, which mature in one or two seasons, consist of a somewhat bony testa, enclosing an oily endosperm, in the center of which lies a cylindrical embryo with one end bearing two to several cotyledons or seed-leaves.

The members of the Pine Family are chiefly distributed throughout the regions tributary to the Pacific Ocean, but they are also numerous around the world in the North Temperate Zone and extend southward especially along the high mountain ranges. It is the largest family of the gymnosperm group, including about forty genera and over three hundred species, a group which may be traced far back through ancient geological periods and which exhibits many primitive structural features.

While great diversity is shown in the reactions of the different species to climatic and soil conditions, many of them are adapted to cold and barren lands, and as a whole are more resistant to drouth during the vegetative season than most of the deciduous broad-leaved trees and shrubs with which we are familiar in our northern latitudes. They form extensive forests, clothing valleys and mountain sides, from sea level to alpine timber lines, and from far north to the tropics. Some species form pure stands, others grow in mixtures; some grow readily on almost any soil and with little or much moisture, while others are very exacting with reference to one or all of the conditions of the environment. As a rule they propagate solely from seeds, which may be produced in superabundance or so few as barely to suffice for a moderate support of the species. And some species at the present time are almost vestigial, being represented by comparatively few individuals in a narrow geographical range. Pollination is effected by the wind. Vast numbers of pollen grains are produced, and these borne by the wind settle on everything, including, by chance, the diminutive ovules; but even this means is sufficient to produce usually large quantities of seeds in many of the species.

This is a family of great economic importance, chiefly from the standpoint of lumber and various wood products, but also as a source of charcoal, tar, resin, turpentine, and oils and gums and balsams used in manufactures and the arts. It is the most important source of lumber for the purposes of general use and construction, owing to the quantities available, the forms in which it can be produced, and the ease with which it can be manufactured. Moreover the value of the forests themselves, over and above their products, is of large importance, considering their effect upon conservation of waters and the wild life of woods and streams, and also from the standpoint of human recreation and enjoyment. Especially is this true in the northern Rocky Mountains where the forests are mainly coniferous, and where almost every considerable forested area that greets the eye is dominated by one or more species of the Pine Family.

KEY TO THE GENERA

- Leaves in clusters of 2, 3, or 5 . . . . *Pinus*
- Leaves in clusters of 10 or more . . . . *Larix*
- Leaves solitary
  - Leaves alternate
    - Leaves sharp-pointed, rigid . . . . *Picea*
    - Leaves softer, blunt or rounded at the end
      - Cones pendent
        - Bracts entirely concealed . . . . *Tsuga*
        - Bracts conspicuous, three-pointed . . . . *Pseudotsuga*
      - Cones erect solid . . . . *Abies*
  - Leaves mostly scale-like, opposite or in circles
    - Sprays flat, cones dry . . . . *Thuya*
    - Sprays bushy, cones berry-like . . . . *Juniperus*

PINUS

PINE

The pines are trees, often of very large size, with straight, excurrent stem, unless stunted or depressed by unfavorable conditions, the crown more or less conical in outline, the shoots of the season growing from winter buds, the stem usually clothed with rough, heavy bark. The leaves of the pines, at least all of ours, occur in fascicles of 2, 3, or 5 at the ends of small spur shoots, which persist for several seasons and then fall away with the leaves they bear, each spur shoot in the axil of a bract which formed one of the scales of the preceding winter's bud, but which in some species are deciduous. Flowers covered in the same winter buds with some of the vegetative shoots, formed the preceding season, the staminate numerous about the base of the shoot of the season, cylindrical, each scale bearing two pollen sacs on its lower surface; the ovulate flowers, from 1 to 6 in number, appear on short lateral spurs near the apex of the shoot of the season, but not on the same one with the staminate. Each ovulate flower consists of a small structure, erect, cylindrical or oval, with spreading scales and bracts. Fruit a woody cone matured at the end of the second season, formed of more or less thickened scales, each bearing normally 2 seeds, the bracts wholly concealed within the cone, which may persist for a number of years before opening to liberate the seeds. Seeds with or without a wing. Embryo with several cotyledons.

About one hundred species of pine are reported by some authors. They are evergreen trees of the Northern Hemisphere, about one-third belonging to North America, and only six of these to the northern Rocky Mountains, where they are the largest and most conspicuous of our forest trees.

The pines are important throughout the country as the source of lumber, also tar, pitch, turpentine, and other distillation products.

KEY TO THE SPECIES OF PINUS

Leaves in clusters of 3	1. *P. ponderosa*
Leaves in clusters of 2	
Cones short ovoid	2. *P. contorta*
Cones long ovoid	3. *P. Banksiana*
Leaves in clusters of 5	
Leaves thick, rather stiff	
Cones purple	4. *P. albicaulis*
Cones golden brown	5. *P. flexilis*
Leaves slender, soft	6. *P. monticola*

1. **Pinus ponderòsa** Laws

Western Yellow Pine. FIG. 1. PLATE 2

A tree reaching a height of 150 feet or more and a stem diameter of 3 to 6 feet, with heavy crown of conical or oval outline, the bark on trunks up to a foot in diameter usually dark and rough with irregular grooves and ridges; on more mature trunks, divided by grooves into large oblong or irregular, flat-topped, yellowish areas which scale off in small flakes; leaves 4 to 6 inches long, usually in clusters of 3, on short spurs in the axils of more or less persistent bracts, rather stiff, pointed, dark green; flowers appearing in May or June, the staminate at first dark red, later yellow, cylindrical, 1 to 2 inches long, ¼ to ⅜ inch thick, from 5 to 20 about the base of the shoot of the season; ovulate flowers usually from 1 to 3 near the apex of the shoot of the season, red, about ⅜ inch in height, about ¼ inch in diameter; cone 3 to 4 inches long, 1½ to 2 inches thick before opening, when open expanding to 2½ or 3 inches, broadly ovoid and often slightly curved to one side, at first red but turning brown, falling from the tree by the rupture of its central axis near the base, the scales armed with a sharp, recurved, deciduous prickle;

PLATE 2 (p. 18)

Western yellow pine in the Bitterroot Mountains

Pinus ponderosa Laws

seeds about ¼ inch long, the wing about ¾ inch in length, about ¼ inch broad, brown, membranous.

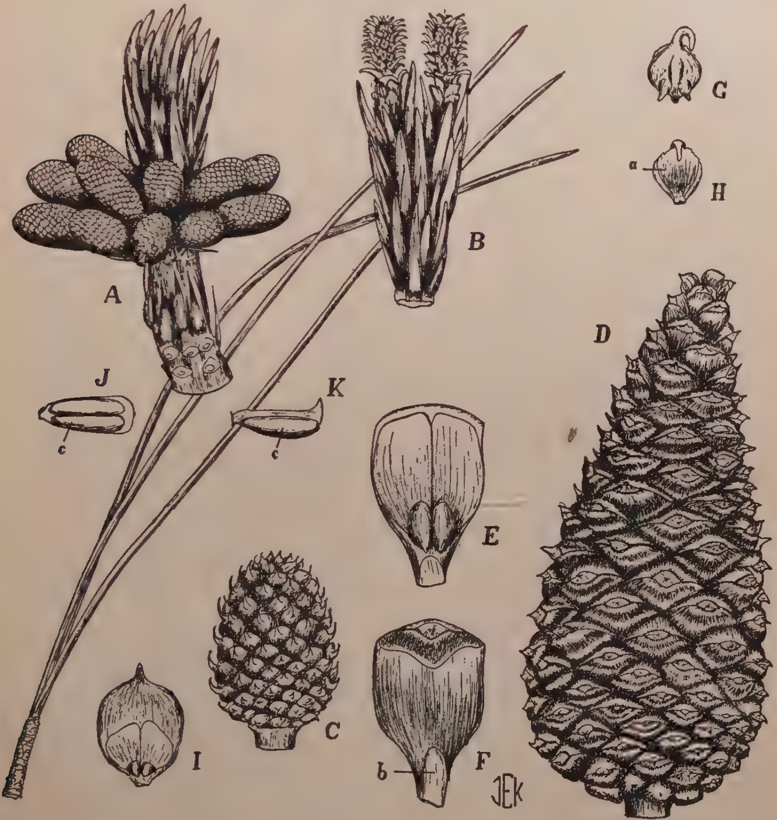

FIG. 1.—*Pinus ponderosa* Laws. Western Yellow Pine

Leaves one-half natural size. Male and female flowering shoots, *A* and *B* respectively, one-year-old cone, *C,* two-year-old cone, *D* and scales *E* and *F,* all about three-fourths natural size; *E,* upper side of seed-bearing scale from *D,* and *F,* lower side of same showing bract, *b; G* and *H,* upper and lower sides respectively of seed-bearing scale from *B,* with bract at *a,* ×6; *I,* seed-bearing scale from *C,* natural size; *J* and *K,* lower side and flank respectively of pollen-bearing scale from the flowers of *A,* showing pollen sacs, *c,* ×6.

This species has a very extensive range, being found from British America to Mexico and from the Black Hills to the Pacific; in the Canadian Rockies and the Selkirk Range, in the Columbia and the Kootenai valleys, probably not east of the Rocky Mountains north of

49°; in Montana, near Missoula, Paradise, Troy, Flathead Lake, Lolo, Hamilton, Harlowton; in Yellowstone Park, in Upper Geyser Basin, and about Yellowstone Lake and Falls.

This is probably the most common of all forest trees in the Rocky Mountains, in moderately dry situations, less dominant on northern exposures, where other species usually abound to its exclusion, the most resistant of all local species to drouth and usually foremost in the forest ranks at the line of contact with the prairie. The most common tree along the rim-rock of the Yellowstone, Musselshell, and other valleys of the plains. In altitude it extends from the lowest levels of the region up to 6,000 feet or more, decreasing northward. It frequently forms high, open forests over grassy or slightly shrubby ground, either pure or mixed with Douglas Spruce, but owing to its need of light it never grows in dense stands.

The Rock Pine (*Pinus scopulorum* Lemmon) closely resembles the Western Yellow Pine, and there is considerable doubt as to whether or not it should stand as a separate species. Some authors regard it merely as a variety of *P. ponderosa,* while others consider it merely as a mountain form of that species. As this form is found only on the eastern side of the Divide from the Yellowstone southward, and as this region represents the eastern or plains border of the range of *P. ponderosa,* its title to specific distinction is exceedingly doubtful.

2. **Pinus contòrta** Loud

Lodgepole Pine. PLATE 3

Ordinarily a small tree 20 to 30 feet in height, but rarely reaching a height of 100 feet and a diameter of 2 feet; branches slender, drooping; the bark thin, scaly, gray; the trunk, where growing in thick stands, slender, pole-like; leaves in pairs, 2 to 3 inches long, rather stiff, pointed, dark green, on short spurs in the axils of more or less persistent brown bracts; flowers appearing in May or June, the staminate yellow, ovate, to the number of 20 to 40 along the lower end of the shoot of the season, ½ to 1 inch long; the ovulate flowers few, near the summit of the shoot of the season, reddish, about ¼ inch long; cones less than 2 inches in length, prickly at first but later becoming smooth, sharply tapering and curved to one side, persistent for years on the branch and usually opening only after several years, light brown in color; seeds less than ⅛ inch long, dark, the wing ¼ to ⅜ inch long, brown, thin.

The Lodgepole Pine is found from Alaska to Lower California and into the interior to the Rocky Mountains and the Black Hills;

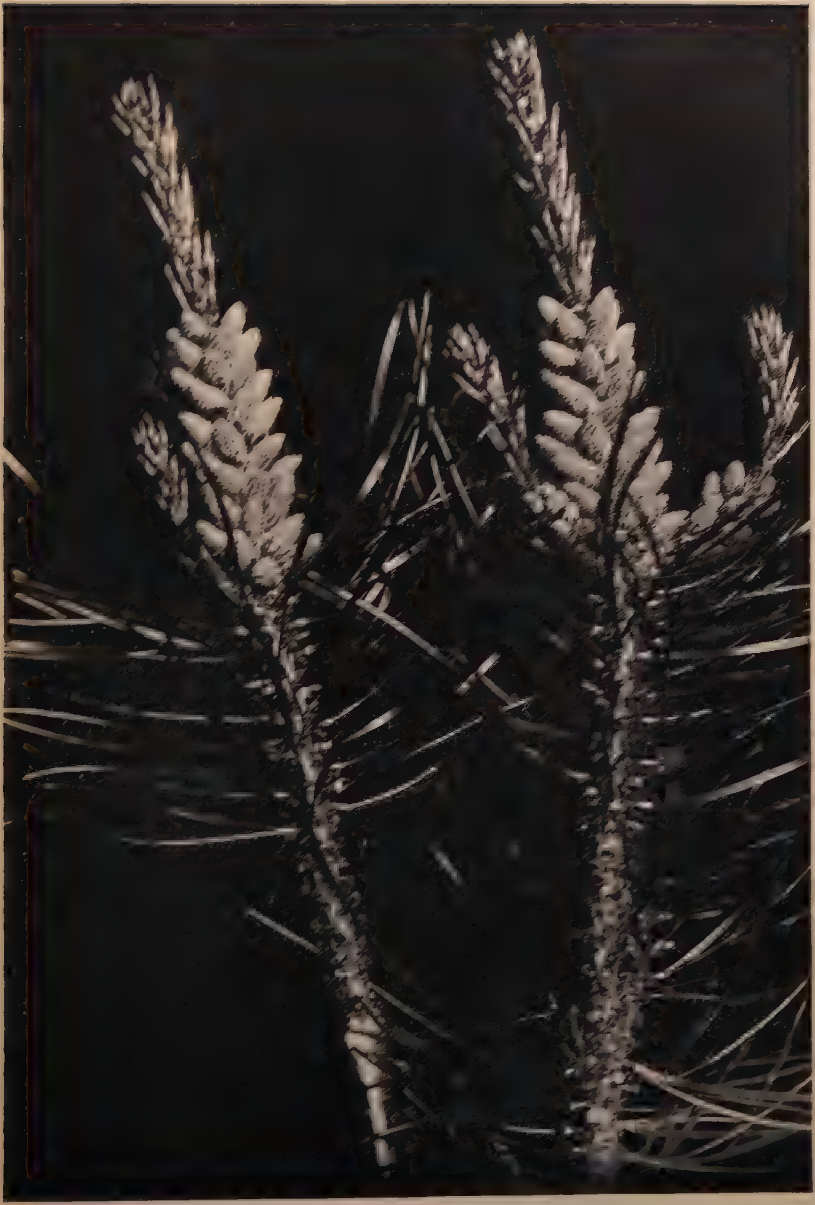

PLATE 3 (p. 29) *Pinus contorta* Loud

Lodgepole pine. Leaves and staminate flowers in June. Missoula, Montana

in the Canadian Rockies, along the line of the Canadian Pacific Railway; in Montana, on the Mitten Mountain near Missoula, on the summit of the Continental Divide between the Bitterroot Valley and the Bighole, about Waterton Lake in Glacier Park, and along the east side of Flathead Lake, near Haugan, Georgetown, and many other places; in Idaho, south of Priest Lake and elsewhere. It is common in Yellowstone Park.

In our region this tree often occupies exclusively the cooler and moister situations with extensive pure and sometimes almost impenetrable stands; in drier places forming scattering stands mixed with other trees and shrubs, but of lower and more spreading form. In British Columbia it is the characteristic tree over the northern part of the interior plateau and densely covers great areas. In the Peace River country it occurs over an extensive region, mostly on higher elevations and poor soil. In Montana it is found chiefly at higher elevations, usually between 4,000 feet and the sub-alpine zone, at higher altitudes in the southern than in the northern part of the state, but very responsive to local conditions.

Some authors prefer to distinguish coast and mountain forms of this species, the former as *Pinus contorta* Loud, the latter as *P. Murrayana* Balf., or as *P. contorta* var. *Murrayana* Engelm. The stunted form which this tree assumes on the sand dunes along the Oregon coast is of course strikingly different from the tall, slender one of trees of the mountain forests, but inasmuch as environment not only affects the stature of a plant but also the size and structure of its parts it is better to include the different forms under one specific designation as here proposed until some more positive means is found for their differentiation.

This tree was discovered by John Jeffrey, collector of the Oregon Botanical Association of Edinburgh, in northern California in 1852, and was found again on the summit of the Sierra Nevada Mountains near Walker's Pass in 1853.

3. **Pinus Banksiàna** Lamb

Gray Pine

A tree reaching 60 to 70 feet in height, with trunk straight sometimes for 20 to 30 feet, with long spreading branches forming an open, conical crown; twigs green, turning to purple and darker the following year; bark thin, dark reddish-brown, channeled and scaly; leaves in somewhat distant pairs, ¾ to 1¼ inches long, at first light green, becoming darker, deciduous after 2 to 3 years; staminate flowers yellow, in short, crowded clusters; ovulate flowers dark purple; fruit oblong conical, sessile, oblique at the base, usually erect and curved, 1½ to 2 inches long, light yellow when ripe, with thin stiff scales, each tipped with a minute, incurved, and finally deciduous prickle; seeds with wing about ⅜ inch long, about ⅛ inch wide.

The range of this species is from Nova Scotia and New York to the valley of the Mackenzie River and the Arctic Circle. Not known in the Rocky Mountains within the United States.

4. **Pinus albicaùlis** Engelm.

Whitebark Pine. PLATE 4

Usually a tree of medium size, 20 to 40 feet in height and a diameter of a foot or two, but reaching in sheltered places a stem diameter rarely of 4 to 5 feet and possibly a greater height than 40 feet, often divided above into a few large, upright branches, the lateral branches descending and curving up sharply at the ends, the whole forming a rounded crown; the bark thin, scaly, and light gray, hardly broken into definite areas; leaves in fives, about 2 inches in length, rigid, blunt, of a faintly bluish-green cast, the spurs naked and the subtending bracts deciduous; flowers of the ovulate kind sometimes as many as six in a whorl near the end of the shoot; cone about 2 to 3 inches long, ovoid, blunt, purple, with thick, heavy scales not armed with prickles; seeds ¼ inch or more long, thick, brown, and practically devoid of wings; the cones of this species do not open to scatter the seeds.

The distribution of *Pinus albicaulis* is from British Columbia and Alberta to Wyoming and California; in Canada, from Castle Mountain to the Selkirks; common between Bow Pass and the 49th parallel, and in the Sweetgrass Hills; in Montana, in Swiftcurrent Pass in Glacier Park, in the Swan Range east of Bigfork, on Mount Lolo in the Bitterroot Mountains, in the Upper Gallatin country, and in Spanish Basin; in Idaho, on Striped Peak, near Wallace; also in Yellowstone Park. It is a common tree from the upper limit of tree growth, where it is depressed and scraggy, down to 6,000 or 5,000 feet.

The tree was first discovered by John Jeffrey on the summit of a mountain near Fort Hope in British Columbia in 1851. It was again collected by Newberry in the Cascade Mountains of Oregon in 1855. His were the first field studies, and it was probably from Newberry's material that Engelmann described this tree as a new species in 1863.

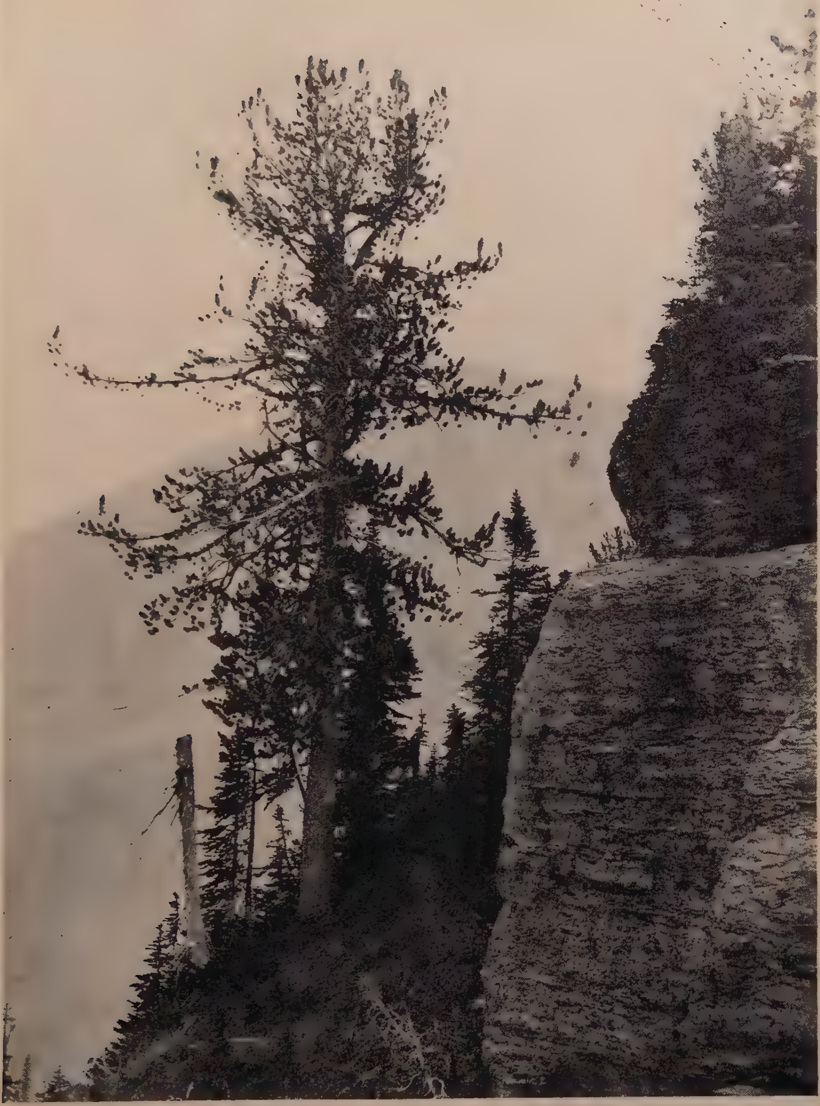

PLATE 4 (p. 22) *Pinus albicaulis* Engelm.

Whitebark pine in Glacier National Park

5. **Pinus fléxilis** James

Limber Pine

A tree usually 40 to 50 feet in height and a diameter of 2 feet or less, bark of the old trunks dark brown, deeply fissured between rectangular blocks, that of the branches light gray, shining, smooth; leaves very similar to those of the preceding species; staminate flowers reddish, the ovulate red-purple; cones 3 to 4 inches long, narrowly ovoid, golden brown, without prickles, opening when mature; seeds thick, rounded, grayish-brown, scarcely winged.

This tree is found on the east side of the Divide in Alberta and Montana, south to New Mexico, Arizona, Nevada, and California. The following localities may be mentioned: in Alberta, along Bow River from Calgary to Morley, and in the eastern and lower part of South Kootenai Pass; in Montana, near Bozeman, near Chouteau, on Indian Creek tributary to the Madison, and in the Belt and Absaroka ranges; also in Yellowstone Park. It is a tree of the high altitudes up to 9,000 feet, often stunted in exposed situations.

6. **Pinus montícola** Dougl.

Western White Pine. PLATES 5 AND 8

A large forest tree reaching a height of 150 feet and a stem diameter of 4 to 7 feet, with small branches and narrow crown, the trunk covered with a thin gray bark cut into small oblong or rectangular blocks and often clear from ½ to ⅔ its length, the bark on young trees usually smooth; leaves in fives, about 3 inches long, slender, flexible, with a faint bluish-green cast, the thin subtending bracts deciduous; staminate flowers yellow, the ovulate red; cones 8 to 10 inches long, 1 to 2 inches thick, slightly curved, yellowish-brown, the scales thin, unarmed; seeds about ¼ inch long, ovate, the wing ¾ to 1 inch long, thin.

The distribution of this species is from British Columbia to Montana and California; in the Canadian Rockies, on the slopes of the Columbia Valley near Donald; in Montana, on Bull Lake south of Troy, on the east side of Flathead Lake, in the Swan Valley east of Bigfork, near Haugan, and on McDonald Creek in Glacier Park. (Probably the largest known specimen of this tree in the Rocky Mountains occurs on McDonald Creek at Big Pine Camp, a few miles above Lake McDonald. This tree has a circumference of 21 feet at breast height.) In Idaho splendid forests of White Pine occur along Priest River in the Panhandle, in the St. Joe Mountains, and on the western slopes of the Bitterroots and the Coeur d'Alenes. Probably it is not found east of the Continental Divide.

This splendid tree was discovered by David Douglas on the high mountains near Mount St. Helens in 1825.

LÀRIX

Larch

The larches are deciduous conifers. In the fall the leaves turn yellow, and in the winter the trees are devoid of foliage, the leaves reappearing in bright green tufts the following spring, borne to the number of 10 to 40 in brush-like clusters. On the shoots of the season the leaves are always singly arranged and equally distributed along the branch, but at the close of the first season lateral buds appear here and there in the axils of these leaves and in the following season give rise to the leaf clusters, which they continue to bear for several years. The clusters are thus borne upon short, lateral branches, as in the pine, with the differences that in the larch the number of leaves is indefinite, such lateral branches are fewer in number, and they continue to grow slowly during the period in which they bear leaves. In the early spring flowers appear from buds formed the preceding season, but solitary and not clustered, as in the pine. Both kinds of flowers are small and inconspicuous; the ovulate ½ to ¾ inch long, erect, the bracts outstanding and usually red, each scale bearing 2 ovules; the staminate flower is globose, yellow, each scale bearing 2 pollen sacs. The flowers appear before the leaves. Upon fertilization the ovulate flowers turn downward and the staminate flowers wither and fall. The fruit is matured in one season, and consists of a small cone an inch and a half or less in length and less than an inch in thickness, with thin scales and slightly protruding bracts. The seeds are less than ⅛ inch in length, with wings three or four times as long, providing for their wide distribution on even moderate winds.

The genus *Larix* is composed of about eight species of trees, confined to the cooler portions of the Northern Hemisphere, Europe, Asia, and America. Three are found in the United States.

PLATE 5 (p. 23) *Pinus monticola* Dougl.

Western white pine in the Priest River Valley

The graceful form and habit of the trees make them desirable for planting, and some Asiatic species have been introduced into the United States (*L. dahurica, sibirica, leptolepis*). Some are important timber trees.

KEY TO THE SPECIES OF LARIX

Cones usually less than 1 inch long	1. *L. laricina*
Cones over 1 inch long	
Twigs smooth	2. *L. occidentalis*
Twigs hairy	3. *L. Lyallii*

1. **Larix laricìna** (DuRoi) Koch

American Larch

Slender tree reaching a maximum of 90 feet in height and a diameter of 2 to 3 feet, the branches spreading, the bark slightly roughened, the twigs stout, pubescent; the branches at first extending down to the ground, at length clear ½ to ⅔ the length of the trunk, which finally is covered with a thin, scaly, brown bark, outwardly weathered to an ashy color; leaves in fascicles of 12 to 20, ⅞ to 1⅛ inches long; cones pale russet-brown, ½ to ¾ inch long, ovoid, obtuse, composed of about 12 nearly round, thin scales, their margins entire or slightly torn.

Distributed from Newfoundland and Labrador nearly to Bering Sea, and south to Pennsylvania and Illinois, and along the Rocky Mountains to latitude 53° N.

2. **Larix occidentàlis** Nutt.

Western Larch. FIG. 2. PLATE 6

A large forest tree reaching a height of nearly 200 feet and a stem diameter of 4 to 6 feet, in youth with regular conical outline, in age with an irregular crown, rather narrow and sparse; the bark very heavy about the base, but on the upper part of the trunk gray or yellowish, furrowed, the areas between the furrows flat, scaly, oblong or irregular; leaves 15 to 30 in each cluster, pale green, 1 to 2 inches long, triangular in section; staminate flowers solitary, globose, about ¼ inch broad, ovulate erect, red, ½ to ¾ inch high, both terminal on short lateral branches; cones oval, 1 to 1½ inches long, brown, the scales thin rigid, the points of the bracts equaling or slightly exceeding them; seeds small, with ample wings.

This species ranges from British Columbia to Oregon and Montana. In the Canadian Rockies it is common in the Kootenai and Columbia valleys. In Montana it is confined mostly to the northwestern part of the state, being plentiful near Libby, Kalispell, and Flathead Lake, also in Hellgate Canyon near Missoula and on Mount

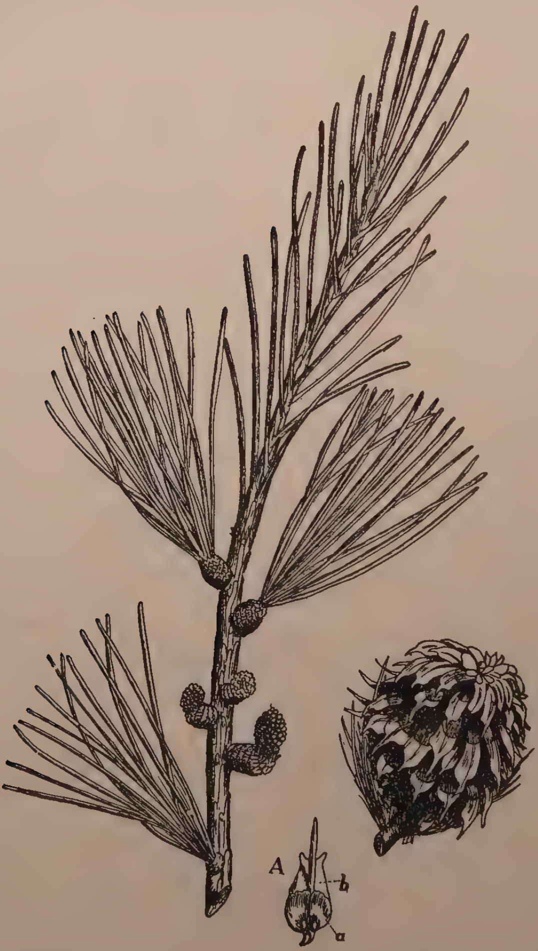

Fig. 2.—*Larix occidentalis* Nutt. Western Larch
Branch and cone about natural size; *A*, lateral members of a young ovulate cone, upper side, *a*, scale with two ovules, *b*, bract, ×4.

PLATE 6 (p. 25) *Larix occidentalis* Nutt.

Western larch in the Flathead Valley

Haggin in Deer Lodge County. In Idaho it grows to large size along Priest River in the Panhandle and is found also in the Coeur d'Alene region and the Clearwater drainage.

The Western Larch in the Rocky Mountains is mostly confined to stream bottoms, northern slopes, or other situations well supplied with soil moisture and without high summer temperatures. It occupies limited areas with pure stands and ascends the mountains to about 4,000 or 5,000 feet.

3. **Larix Lyállii** Parl.

Alpine or Lyall's Larch

A small tree seldom exceeding 50 feet in height and a diameter of 2 feet, with crooked branches and more or less irregular crown, with straight, clean, rather short stems clothed with a thin, ashy gray bark, the twigs of the last year or two distinctly woolly; leaves less than 2 inches long, 30 to 40 in each fascicle; cones 1 to 2 inches long, ellipsoid, red, sessile or nearly so, the scales with ragged margin, the bracts distinctly longer, 3-lobed. Seeds small, winged.

Lyall's Larch is found from British Columbia to Alberta and south to Oregon and Montana, where it occurs only at very high altitudes, at the uppermost limits of tree growth. In the Canadian Rockies it forms the last belt of timber on all peaks of the Rocky Mountains above 7,000 feet, from Cascade Mountain, Bow River Valley, westward on the line of the Canadian Pacific Railway. It occurs on Sheep Mountain on the east side of Waterton Lake, and on the summit of South Kootenai Pass. In Montana it is found as far south in the Bitterroot Range as the Nez Perce Pass and the Lochsa-Selway Divide. Also on Mount Lolo near Missoula. In the main range of the Rockies on the Middle Fork of Sun River, and on Mount Haggin near Anaconda.

PÌCEA

SPRUCE

The spruces are forest trees, some of the species reaching large size, their twigs, when the leaves have fallen, covered with the small peg-like protuberances. The leaves are borne singly, are usually rigid, sharp-pointed, and more or less angled, tardily deciduous, resulting in a dense crown of foliage at all seasons of the year; the flowers are borne near the ends of the branches, the staminate solitary in the axils of the leaves, short oblong or cylindrical, the scales each bearing two pollen sacs; the ovulate flowers are terminal on the small twigs, or nearly so, and consist of an erect axis bearing lateral scales and bracts, each scale bearing two ovules on its upper side. After pollination the ovulate flower turns downward and remains so. The fruit matures in one season and consists of an oblong or oval cone, with thin scales, each of which normally bears two seeds and is subtended by a minute bract. At maturity the scales spread apart and the seeds are liberated to be carried away on the wind by the aid of the ample wings with which they are furnished.

There are about 12 to 14 species of spruce distributed through the north temperate and the sub-tropical regions of both hemispheres. In America they form a conspicuous part of the far northern flora, especially favoring situations of abundant moisture in soil and air. Native and exotic species are widely planted throughout the northern states, and include largely the Norway Spruce (*Picea excelsa* Link), the Weeping Spruce (*Picea Breweriana* S. Watts.) and the Colorado Blue Spruce (*Picea pungens* Engelm.). The largest of our native spruces is the Tideland or Sitka Spruce (*Picea sitchensis* Traut. & Mey.) of the northwest coast.

These are important timber trees, not only for the common uses to which their lumber is put, but for many special purposes for which they are exceptionally fitted by reason of the long fibers, great strength, and resiliency of the wood, combined with its lightness in weight and other physical properties, which have made them highly desirable for paper pulp, airplane frames, musical instruments, etc.

KEY TO THE SPECIES OF PICEA

Cones small, purple	1. *P. Mariana*
Cones brown	
Cones 1½ to 2 inches long	
Young twigs smooth	2. *P. canadensis*
Young twigs minutely hairy	3. *P. Engelmannii*
Cones 2 to 3½ inches long	4. *P. pungens*

1. **Picea Marìàna** (Mill) B.S.P.

Black Spruce

A slender tree, at its best 90 feet high and 2 to 3 feet in diameter, usually much smaller, with spreading and usually drooping branches and but slightly roughened bark; twigs stout, russet-brown, pubescent; leaves crowded, deep blue-green with a tinge of white, rarely more than ½ inch long, obtuse at the apex, or with a minute, spur-like point; staminate flowers nearly globular, red, the ovulate oblong-cylindrical, purple; cones oval or ovoid, 1 inch or less in length, persistent on the twig for several seasons, their stems stout, curved downward or inward toward the branch, the scales deep purple, stiff, with entire or ragged margins; seeds deep brown, about ⅛ inch long.

The range of the Black Spruce is transcontinental from Newfoundland to Hudson Bay and the Alaskan coast at Cook Inlet, south to New Jersey and along the higher Alleghenies to North Carolina, and to Michigan and Minnesota. It covers great areas through Saskatchewan and Alberta and north through the valley of the Athabasca to the Mackenzie. It is not known in the Rocky Mountains south of the International Boundary. Macoun says of this tree that from Lake Winnipeg westward it becomes magnificent, averaging from 2 to 3 feet in diameter and reaching a height of 80 feet, and that it creeps closest of any of the northern conifers to the cold waters of the Arctic Sea. "At its northern and southern limit it nearly loses its tree form, becoming in the north a bush, while in the south in the deep swamps it is little larger than a hop-pole."

2. **Picea canadénsis** (Mill) B.S.P.

White Spruce

A tree at its maximum reaching over 100 feet and a diameter of 3 to 4 feet, but usually much smaller, commonly clear of branches ⅓ to ⅔ of its height, with an open, often irregular and widely pyramidal crown, the top of which, especially in old trees, may be rounded or flattened but is often sharply pointed; the branches long and thick, sagging but curved upward near the ends, the twigs smooth, pale, covered with a bloom, the numerous laterals drooping; leaves light green, slender, ¾ inch or less in length, curved toward the upper side near the end of the shoot, giving off a fetid odor when crushed; staminate flowers pale red or yellow, the ovulate oblong-cylindrical, with reddish- or greenish-yellow scales; cones weakly attached and falling early, from 1 to 2½ inches long, ½ to ¾ inch thick before the scales open; the scales thin, flexible, with margins usually entire, pale straw-color or brown at maturity; seeds about ⅛ inch long, with narrow wings.

The range of the White Spruce is from Newfoundland to Alaska, reaching northward nearly to the Arctic Sea in the east but on the whole more southerly than *P. Mariana,* south to Maine, New York, Michigan, the Black Hills, Montana, and British Columbia. In Alberta ascending the Bow River from Calgary and mixed with Engelmann Spruce at Silver City (Macoun). It is said to occur along the eastern slope of the Rockies in Montana, extending down from the north, but definite localities are not reported.

3. **Picea Engelmànnii** Engelm.

Engelmann Spruce. FIG. 3. PLATE 7

A tree 100 to 150 feet in height, sometimes 3 to 5 feet in diameter, with thin, scaly bark and spreading branches and often with drooping branchlets, forming an oblong or narrowly conical crown; twigs pubescent for 3 to 4 years, brown or gray; leaves rigid, sharp-pointed, often covered with a whitish bloom, especially in the younger specimens, on the lower branches standing out in all directions from the twig but on the upper limbs curved sharply upward, the lower ones usually distinctly 4-angled in cross section; staminate flowers dark purple, the ovulate light red, oblong-cylindrical; cones about 2 inches long, ¾ inch thick, oblong, often produced in large numbers near the ends of the branches, the scales thin, with entire or ragged margins; seeds about ⅛ inch long, much shorter than the broad, very oblique wings.

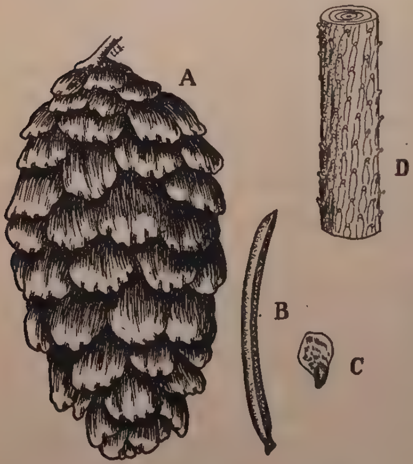

FIG. 3.—*Picea Engelmannii* Engelm. Engelmann Spruce

A, mature cone; *C,* seed of same; *D,* piece of twig, showing surface. All about natural size. *B,* leaf, about one and one-half natural size.

This tree is found from the Yukon to Alberta, and over the higher elevations of the Rocky Mountains and the Cascades to New Mexico, Arizona, and California. In the Canadian Rockies it occurs along the line of the Canadian

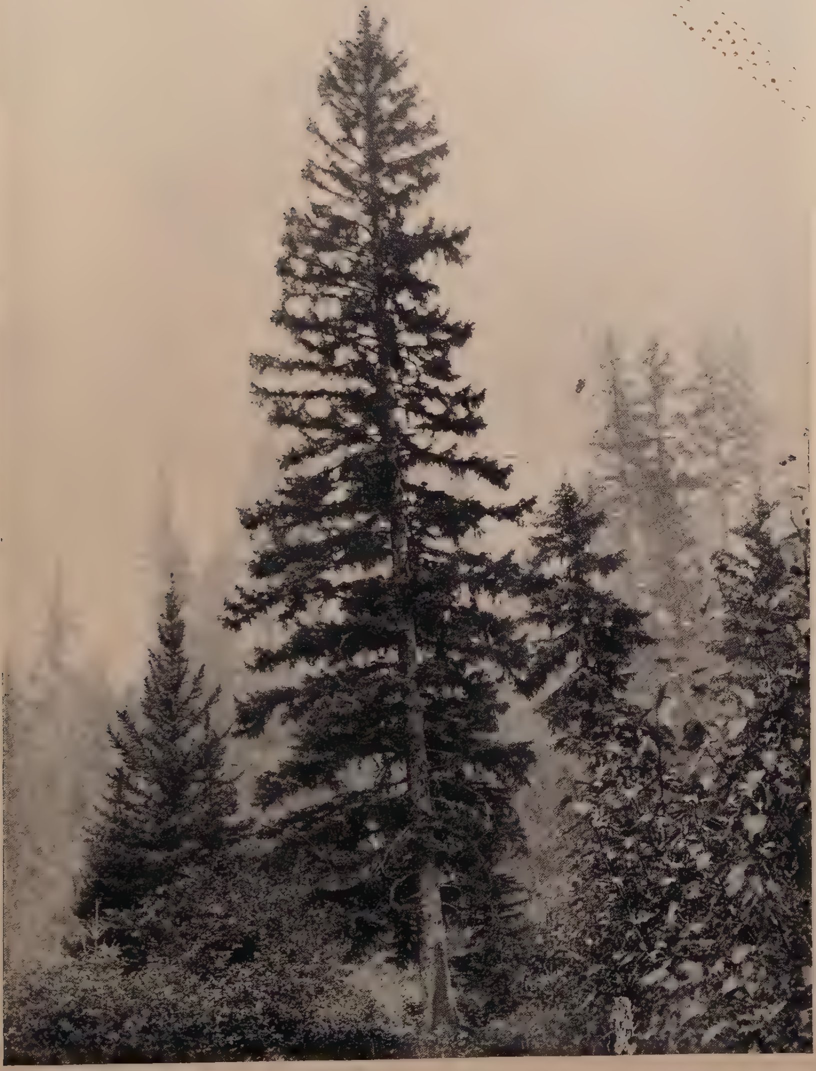

PLATE 7 (p. 30) *Picea Engelmannii* Engelm.

Engelmann Spruce in Glacier National Park

Pacific Railway at Castle Mountain, Laggan, and Kicking Horse Lake. "In the Columbia Valley and all valleys of the Selkirk Mountains it grows to a great size, often being 4 feet in diameter and over 150 feet in height. It is more a tree of the valleys than of the mountains, seldom ascending over 6,000 feet" (Macoun). It is one of the most common trees in Glacier National Park in Montana, being abundant in Swiftcurrent and Brown passes and in Avalanche Basin, on Trapper Creek bottoms on the West Fork of the Bitterroot River, at Virginia City, and in the Little Belt and Crazy Mountains; in Yellowstone Park, on East DeLacy's Creek and in Upper Geyser Basin; in Idaho on Priest River and throughout the wooded northern portion of the state in the cooler and moister localities.

The Engelmann Spruce in Montana is common in the cool mountain canyons along streams and lakesides, seldom far from the water, or it is found on high slopes where the snow lies most of the year and the soil is always wet. The fact that this tree seldom is found at its best in the wide valleys, even where soil moisture is abundant, but reaches its best form and largest size in narrow gulches and on mountain sides at comparatively high altitudes, seems to indicate that it is as much dependent upon high relative humidity in the atmosphere as upon water in the soil.

4. **Picea púngens** Engelm.

Colorado Blue Spruce

A tree at its maximum development reaching a height of 150 feet and a diameter of 3 feet, more often 80 to 100 feet high, with scaly, gray bark, the branches in remote whorls forming a conical crown, the numerous stiff branches spreading laterally to form a flat system; twigs smooth, green, with a bloom, becoming orange-brown during the first winter, duller brown later; leaves ½ to 1¼ inches long, stout, rigid, and tipped with a sharp point, dull bluish-green to silvery white; staminate flowers reddish-yellow, the ovulate greenish; cones usually about 3 inches long, oblong-cylindrical, at first green or tinged with red, becoming brown and lustrous at maturity, the scales tough, roughly diamond-shaped, flexuous on the margins and acutely pointed; seeds about ⅛ inch long, about half as long as the wings.

The Blue Spruce is found in the central Rocky Mountain region and reaches the northern limit of its range in Yellowstone Park or southern Montana, usually occurring at altitudes of between 6,500 and 10,000 feet.

TSÙGA

HEMLOCK

The hemlocks in general may be described as large forest trees with straight central shaft, the topmost shoot of which usually hangs to one side, the outline of the crown pyramidal or conical, and the foliage usually dense, evergreen, but falling readily in drying. The leaves are flat, rounded or pointed at the apex, usually abruptly narrowed to a short stalk at the base, the twigs and leaves mostly disposed in a horizontal spray; the leaves when falling leave a small protuberance on the branch. The staminate flowers appear in the axils of leaves of the preceding year; the pollen sacs are confluent and open by a transverse slit; the ovulate flowers are terminal on twigs of the preceding year; the bracts are inconspicuous and the scales in a few series likewise. The cones are pendent and mature in one season, the scales spreading when mature to liberate the seeds, two of which normally are formed on the upper side of each scale. The seeds are small, attached to an ample wing.

This is a genus of about eight species, belonging to the cooler parts of the Northern Hemisphere, four in North America and four in Asia. The species originally described came from Japan. The two of the North American species native to the Pacific Slope are sparingly represented in the Rocky Mountains as far south as Montana.

KEY TO THE SPECIES OF TSUGA

Leaves grooved above, cones less than 1 inch long.........	1. *T. heterophylla*
Leaves ridged above, cones over 1 inch long...............	2. *T. Mertensiana*

1. **Tsuga heterophýlla** (Raf.) Sarg.

Western Hemlock. FIG. 4. PLATE 8

A tree reaching in our region probably a height of 150 feet and a diameter of 3 to 4 feet, the base of the trunk often thickly buttressed, in older trees often clear of branches for many feet, the bark gray, firm, rough, the crown of broadly conical form, with many strong, drooping branches; leaves ½ to ¾ inch long, flat, grooved above, blunt at the apex, dark green above, with two broad whitish bands beneath; staminate flowers yellow, the ovulate red or purple; cones narrowly ovoid, ½ to 1 inch long, pendulous, the scales obovate, striate, persistent; seeds small, winged.

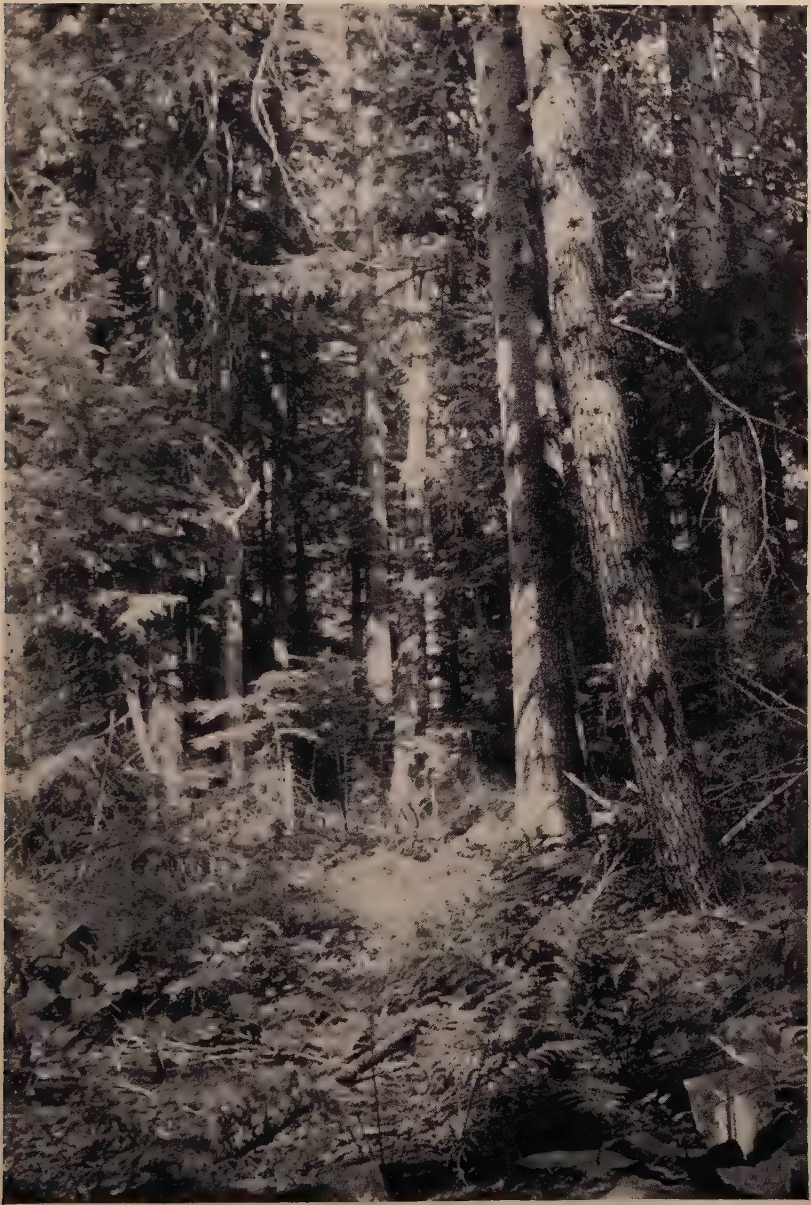

PLATE 8 (pp. 23, 32) *Pinus monticola* Dougl.; *Tsuga heterophylla* (Raf.) Sarg.

White pine and hemlock in the Priest River Valley

Tsuga heterophylla is found from Alaska to Oregon, Idaho, and Montana. In the Canadian Rockies it appears along the line of the Canadian Pacific Railway at Donald, at Beaver Creek, and in the Selkirks. In Idaho it is plentiful in the Panhandle on Priest River and on Beaver Creek. In Montana it grows to large size in Avalanche Basin in Glacier Park, and is found also in the Swan Valley and other parts of the Flathead Basin.

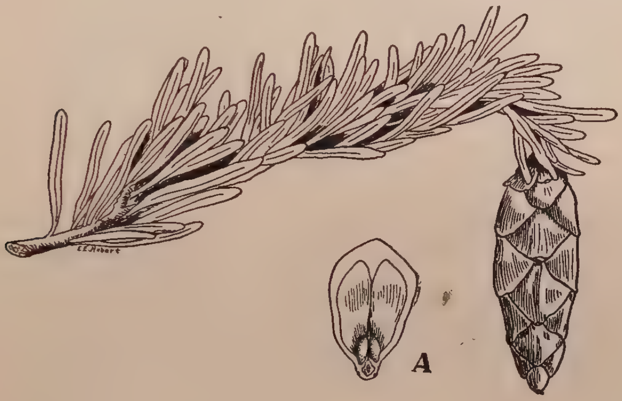

FIG. 4.—*Tsuga heterophylla* (Raf.) Sarg. Hemlock

Twig and cone slightly enlarged. *A*, seed-bearing scale, upper side, with two seeds, ×1½.

The Western Hemlock occurs only in the most humid situations in the northern Rocky Mountains. It reaches its best development on the seaward side of the Cascade Mountains in Oregon and northward, where it may attain a height of 250 feet and a diameter 6 feet or more. This is a tree of the deep forests, enduring much shade and thriving best in sheltered places, where the bulk of its roots creep through the leaf mould on the surface of the ground. It propagates abundantly, and thousands of seedlings cover the forest floor, fallen logs, and decaying stumps in the most favorable localities.

2. **Tsuga Mertensiána** (Bong.) Sarg.

Mountain Hemlock

A tree attaining sometimes a height of 60 and a diameter of 4 feet, the trunk covered with a heavy furrowed bark in old age, where growing in heavy forests assuming a good form, with slender, straight, and clear stems, but in the open branched low, the crown of narrow pyramidal form with drooping branches; leaves plump, pointed, less than 1 inch long, with a low ridge along the middle line on the upper surface; staminate flowers purple, ovulate flowers erect, dark purple or yellowish-green; cones about 1½ inches long, about ½ inch thick, cylindrical, the scales obovate, striate; seeds small, winged.

The range of this tree is from Alaska to the high Sierras of California, and to Idaho and Montana. In Idaho it occurs on Striped Peak, near Wallace; in Montana near Taft in the Coeur d'Alenes. Rare.

PSEUDOTSÙGA

SPRUCE

Large forest trees reaching in our region a height of 100 feet or more and a stem diameter of 2 to 3 feet, the bark on young trees smooth, marked by resin blisters, on old trees heavy, firm, deeply grooved, gray; leaves solitary, flat, slightly grooved above and marked by a ridge beneath, the apex blunt; flowers of both kinds from buds of the preceding season; the staminate flowers in the axils of the leaves near the ends of the twigs, oblong-cylindrical; the ovulate terminal or nearly so, erect, green, the bracts conspicuous, two ovules on the upper surface of each scale; cones pendent on the branch, consisting of broad, thin, concave scales, each bearing two seeds and subtended by a prominent 3-pointed bract. The cones persist for some time on the tree, are ripened in one season, and when mature spread apart their scales to liberate the seeds, which are readily carried by the wind, owing to the ample wings with which they are provided.

The genus is represented by four species, two in western North America and two in Asia. One of the American species is restricted to a narrow area in southern California; the other is widely distributed over the western part of the continent.

Pseudotsuga taxifòlia (Poir.) Britt.

Douglas Spruce. FIG. 5

A large forest tree, reaching probably in our region a height of 100 feet and a diameter of 3 feet, the young stems smooth, marked by many resin blisters, in age becoming dark gray, several inches thick, deeply grooved, and of a yellowish color within, marked by reddish streaks; the branches sag below, above are more or less horizontal, giving the crown an ovoid outline, the lower twigs disposed largely in a horizontal plane; foliage dark green, soft to the touch, dense, the leaves about 1 inch long, flat, slightly grooved above, and marked beneath by two light bands beside the prominent midvein, the apex blunt, the base narrowed to a short stalk, the foot of which is left when the leaf falls, forming a slight peg-like elevation on the branch; staminate flowers yellow, oblong-cylindrical, about ½ inch long, the ovulate green, erect, with prominent bracts, about ½ inch long; cones 2 to 3 inches long, ¾ to 1 inch in diameter, oblong, the 3-pointed bracts thrust out beyond the length of the scale; seeds ⅛ to ¼ inch long, attached to a broad wing.

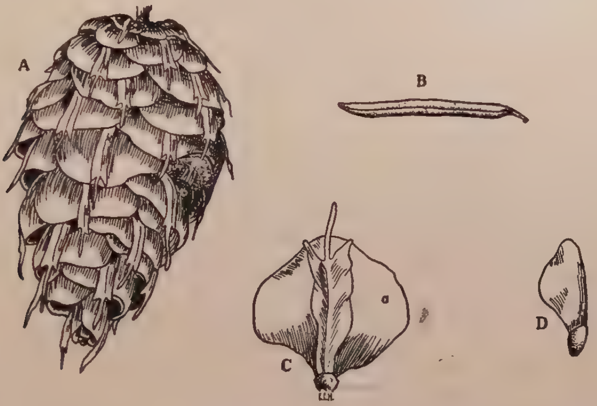

FIG. 5.—*Pseudotsuga taxifolia* (Poir.) Britt. Douglas Spruce
A, mature cone; *B,* leaf; *C,* seed-bearing scale with bract at *a,* lower side; *D,* seed. All about natural size.

The Douglas Spruce has a distribution extending from British America to Mexico and from the Rocky Mountains west to the coast. In the Canadian Rockies it grows, to an altitude of 6,000 feet in stunted form, on Bow River east of Calgary, and in the Selkirk Mountains; in Idaho, along Priest River, near Wallace, and on Lake Coeur d'Alene; in Montana, about Missoula, Columbia Falls, Hamilton, Spanish Basin, Electric Peak, Bozeman, and Great Falls.

Where this tree grows at its best in western Oregon and Washington, it reaches a height of 300 feet or more and sometimes as much as 12 feet in diameter. It seems to thrive in a moist soil and moderate temperature, though it exhibits remarkable powers of resistance to drouth, as shown by the fact that it is a close second to the Western Yellow Pine in occupying dry southwestern slopes. The Rocky Mountain conditions are much less favorable than those along the coast, and its importance as a timber tree there diminishes accordingly. It is the most important source of lumber of all the forest species of the Pacific Northwest, being employed in a great variety of ways—for ship masts and spars, heavy construction of all kinds, building, finishing, etc.

This splendid tree was first discovered in 1791 on the shores of Nootka Sound by Archibald Menzies who was a surgeon on Vancouver's voyage. It was described originally by Lambert as *Pinus taxifolia,* the account appearing in 1803. David Douglas, employed as a biological explorer by the Horticultural Society of London, who contributed probably more than any other one man to the knowledge of our northwestern plants in his time, also found this tree in Oregon in 1827 and among many other plants introduced it into cultivation in England, where it is even now widely grown. While it is known by many other common names (Oregon Pine, Red Fir, Yellow Fir, Douglas Fir, etc.) the designation Douglas Spruce seems well employed, both for the reason of its association with the great botanical explorer and because its botanical characters more closely resemble those of the spruce than those of the fir.

ÀBIES

Fir

The firs are evergreen trees of conical form, the bark at first smooth and marked by resin pockets, the branches forming in wide, flat sprays and disposed more or less in whorls. The leaves are flat, alternate, solitary, closely arranged along all sides of the twigs, those on the lower branches straight, longer than the upper, and with petioles twisted so as to bring all into a horizontal plane, the leaves on the topmost branches curved upward, rigid. Flowers of both kinds are borne on twigs of the previous year, on different parts of the same tree; the staminate are solitary in the axils of leaves on the lower branches, with persistent scales about the base, each scale with two pollen sacs on the lower side; the ovulate flowers are scaly bodies standing erect on the upper branches of the crown, bearing two ovules on the upper surface of each scale. The fruit is a cone which matures in one season, standing upright in all species until completely disintegrated, the seeds, scales, and bracts falling away from the central spike-like axis, which remains standing on the branch. Two seeds are borne on each scale, accompanied usually by ample wings, having brief vitality and commonly low percentage of germination.

About twenty-five species of fir are known, distributed throughout the cooler regions of the Northern Hemisphere, and most abundant on the Pacific Coast of North America. In the Rocky Mountains five species are recognized, three of which come within our range.

The wood of the firs is soft, weak, not durable when exposed to the weather; nevertheless some species afford a lumber of considerable value for certain purposes. *Abies balsamea* is the source of Canada Balsam, a commercial product of value in medicine and the arts. The trees of the genus are highly valued for ornamental planting, and exotic as well as native species are freely employed.

KEY TO THE SPECIES OF ABIES

Resin ducts of the leaves not near the epidermis	
Cones green	1. *A. balsamea*
Cones purple	2. *A. lasiocarpa*
Resin ducts near the epidermis on the lower side	3. *A. grandis*

1. **Abies balsámea** (L.) Mill

Balsam Fir

A tree reaching at most 90 feet in height and a diameter of 3 feet, with long slender branches spreading and drooping, in somewhat distant whorls, in the open forming a broad pyramid, the bark on old trees smooth, gray, and bearing numerous resin-blisters, the slender twigs finely hairy, pale green at first but becoming brown or nearly black with age, leaves becoming fragrant in drying, ½ to 1 inch long, linear, dark green and glossy above, pale green or nearly white beneath, with prominent midrib, pointed at the apex; staminate flowers cylindrical, about ¼ inch long, yellow, the ovulate about ¾ inch long, cylindrical, purple; cones nearly cylindrical, tapering slightly toward the apex, 2 to 4 inches long, slightly hairy, scales fan-shaped, about ¾ inch long, slightly less in width, about twice the length of the bracts, which are finely toothed and bristle-pointed; seed about ¼ inch long, half the length of the wing.

This species is at present known from Labrador to Alberta, and south to Virginia and Iowa. Probably not found in Montana.

2. **Abies lasiocàrpa** (Hook.) Nutt.

Alpine Fir. PLATE 1 (*Frontispiece*)

This tree may attain, under the best conditions, a height of 150 feet and a diameter of 3 feet or over. Except where growing in close formation it is densely branched from the top to the ground, the lower branches drooping, the middle and upper mostly horizontal, short, giving the form of the crown a narrow spire-like appearance by which it can be recognized for miles, the lower branches in flat sprays, the bark of the trunk, even on old specimens, smooth, gray, with resin pockets; leaves on the lower branches 1 to 1½ inches long, rounded at the apex, straight but brought by the twisting of the petiole into the same plane as the branching system, those on the upper limbs rigid and sharply curved upward; staminate flowers dark blue, turning violet, the ovulate violet-purple; cones 1 to 3 inches in length, 1 inch more or less in diameter, oblong, dark purple, the scales obovate, narrowed at the base, more than twice as long as the bracts; seeds about ⅛ inch long, with broad wings.

The range of the Alpine Fir extends from Alaska to Alberta in the north and southward through the Cascades to California and the Rocky Mountains to New Mexico and Arizona. In the British Possessions it is found along the Canadian Pacific Railway from Castle Mountain to the Selkirk summit, and generally from 5,000 to 7,000 feet altitude, on the top of House Mountain, south of Little Slave Lake, between Lesser Slave Lake and the Athabasca River, and in the Rocky Mountains of the Peace River country. It is common on all the high altitudes of northern Idaho and Montana, particularly on Striped Peak, near Wallace, and the Coeur d'Alene and Bitterroot Mountains; also in Montana on Bull Lake, south of Troy, in Swiftcurrent Pass in Glacier Park, in the Swan Range east of Bigfork, in Gibbon Pass at the head of the Bitterroot Valley, in the Rattlesnake Canyon near Missoula, and in Old Hollowtop, near Pony.

3. **Abies grándis** Lindl.

Grand Fir. FIG. 6

A large forest tree, on the westward side of the Cascades reaching a height of 300 and a diameter of 6 or more feet, much smaller in the Rocky Mountains, the bark while young smooth, becoming on old trees 2 to 3 inches thick, dull gray, rough, and deeply furrowed, the branches drooping, the outline of the crown oblong, the top of the crown often divided into a few thick, upright branches; leaves 1 to 2 inches long, slightly notched at the apex, straight, but brought by the twisting of the petiole to lie in a horizontal position, green above, pale beneath, the upper leaves curved upward, rigid; staminate flowers pale yellow, the ovulate yellowish-green; cones green, cylindrical, slightly hairy, 2 to 4 inches long, the scales broadly obovate,

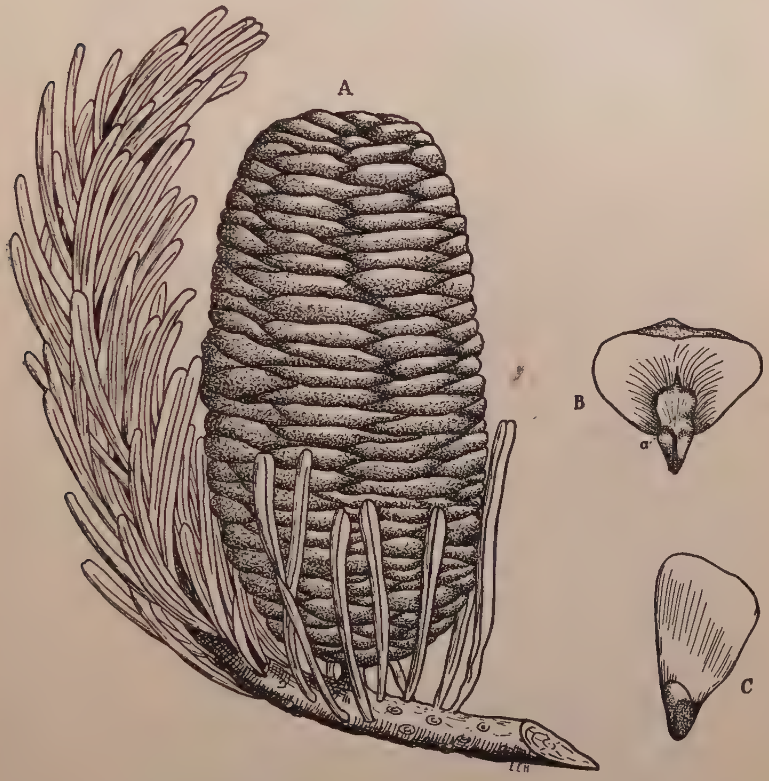

FIG. 6.—*Abies grandis* Lindl. Grand Fir

A, mature cone on branch; *B,* seed-bearing scale lower side, with bract at *a;* *C,* seed. All about natural size.

the bract about half as long as the scale, sharp-pointed; seed about ¼ inch long, attached to a broad, triangular wing.

The range of the Grand Fir is from British Columbia to California, Idaho, and Montana. In Montana it is found at Yellow Bay on Flathead Lake, near Columbia Falls, in Grant Creek Canyon near Missoula, in the canyons north of Clinton, and at Haugan; in Idaho, along the Priest River and in the Coeur d'Alene Mountains. In the Rocky Mountains this tree is found only in the more humid situations.

THÙYA

Arbor Vitae

The trees of this genus are characterized by their evergreen habit, drooping branches and twigs, tough fibrous bark, which separates in long strips, and soft, aromatic, and durable wood. The leaves are opposite, in the form of minute scales so closely applied as completely to cover the twig, and in 4 longitudinal ranks, one above and one beneath and one on either side. Both staminate and ovulate flowers are borne on the same tree, but usually on different branches, the former ⅛ to ¼ inch long, ovoid or globose, the stamens in alternating pairs, with shield-like terminations covering 4 anther-sacs, which open lengthwise, the ovulate flowers ovoid or oblong, composed of 8 to 12 opposite scales, each bearing 2 or more ovules. The cones ripen in one season and are small, erect, ovoid, brown, the scales thickened near the apex, where usually 2 small points appear, usually the middle scales only fertile, and bearing commonly 2 seeds each; seeds oblong, brown, with 2 thin, lateral wings.

Four species of *Thuya* are known, in North America and northern Asia, one of which appears in the Rocky Mountains. They are usually plants of humid regions.

The wood is of considerable value owing to its lightness and durability, being chiefly used for shingles, posts, telephone poles, and lumber. The bark is used in tanning and the leaves have certain medicinal applications. Many forms derived from the known species by horticultural methods are planted for ornamental purposes, some with weeping, others with stiffly upright habit.

PLATE 9 (p. 41) *Thuya plicata* D. Don

Western arbor vitae in the Mission Mountains

Thuya plicàta D. Don

Western Arbor Vitae. Fig. 7. Plate 9

A large forest tree, in the Rocky Mountains reaching a diameter of 10 and a height of 150 feet or more, the stem straight, often free of branches for half or more of its length, strongly buttressed, covered with a thin, stringy bark, which on young trees may be smooth, red or reddish-brown, on old trees rough, gray, divided by long narrow ridges, the shape of the crown in young trees broadly conical with drooping branches and twigs spreading in flat sprays, in older trees often irregular and ragged, open; leaves ¼ inch long or less, scale-like, closely appressed to the slender twigs; flowers 1/12 inch long, brown; cones ½ inch long, narrowly ovoid, reflexed, the scales elliptic, in 3 or 4 pairs; seeds small, flat, winged on both sides.

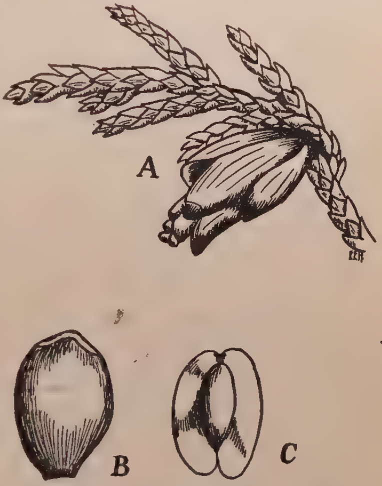

Fig. 7.—*Thuya plicata* D. Don. Western Arbor Vitae

A, branch and mature cone, natural size; *B,* seed-bearing scale, lower side; *C,* seed, ×2.

The range of this tree is from Alaska to northern California, Idaho, and Montana. In the Canadian Rockies it appears as a shrub at about 6,000 feet on the mountains about Kicking Horse Lake; in the Columbia Valley near Donald it forms large groves, and in the Selkirks reaches over 150 feet in height and a diameter of 10 feet; it is abundant in the Kootenai Valley. It appears in Idaho on Priest River, and on Placer Creek, near Wallace; in Montana, on Bull Lake, south of Troy, between Belton and Lake McDonald, near Columbia Falls, and around Lake McDonald in the Mission Mountains.

The arbor vitae is another of the trees entering the Rocky Mountains from the Pacific Northwest, and seeking only the most humid habitats. It is usually associated with hemlock and Grand Fir. In the coast regions of the Northwest it attains prodigious size, 10 to 15 feet or more in diameter, and over 200 feet in height in the most favorable localities, and furnishes one of the most valuable timber trees. The extreme durability of the wood is shown by the fact that other trees of several feet in diameter are sometimes found growing astride fallen logs of this species, the wood of which is mostly sound.

JUNÍPERUS

Juniper

The junipers are trees or shrubs, evergreen, with soft, light, durable, and aromatic wood. The leaves are mostly scale-like, minute, closely appressed to and entirely covering the slender twigs, arranged in alternating pairs or whorls. The staminate and ovulate flowers occur on the same or on different trees, in terminal or axillary position, and oblong or globose in form. The staminate flowers are composed of several opposite or whorled stamens on a slender axis, each bearing 2 to 6 anther cells, which open lengthwise. The ovulate flower consists of a few, mostly opposite, fleshy scales, each usually bearing 1 erect ovule, and subtended by a number of scale-like bracts at the base and persisting on the fruit. The fruit is a small berry-like cone, the scales of which have become united into a globular or ovoid, fleshy, juicy, and aromatic fruit. Seeds solitary or several, ovoid, sharp or blunt, wingless.

Forty or more species are recognized, of which about sixteen are found in North America, all in the extra-tropical regions of the Northern Hemisphere. Three are widely distributed in the northern Rocky Mountains.

The junipers are put to a variety of uses: the wood is largely used for pencils and other small articles; the fruits yield medicinal products and are also used in the flavoring of gin. The wood distilled yields a tar known as oil of cade. Some of the fruits are edible. The trees are widely used in ornamental planting, and many varieties and introduced forms are known.

Key to the Species of Juniperus

Leaves linear, not appressed	1. *J. communis*
Leaves scale-like, closely appressed	
Erect trees or shrubs	2. *J. scopulorum*
Depressed, creeping shrub	3. *J. Sabina*

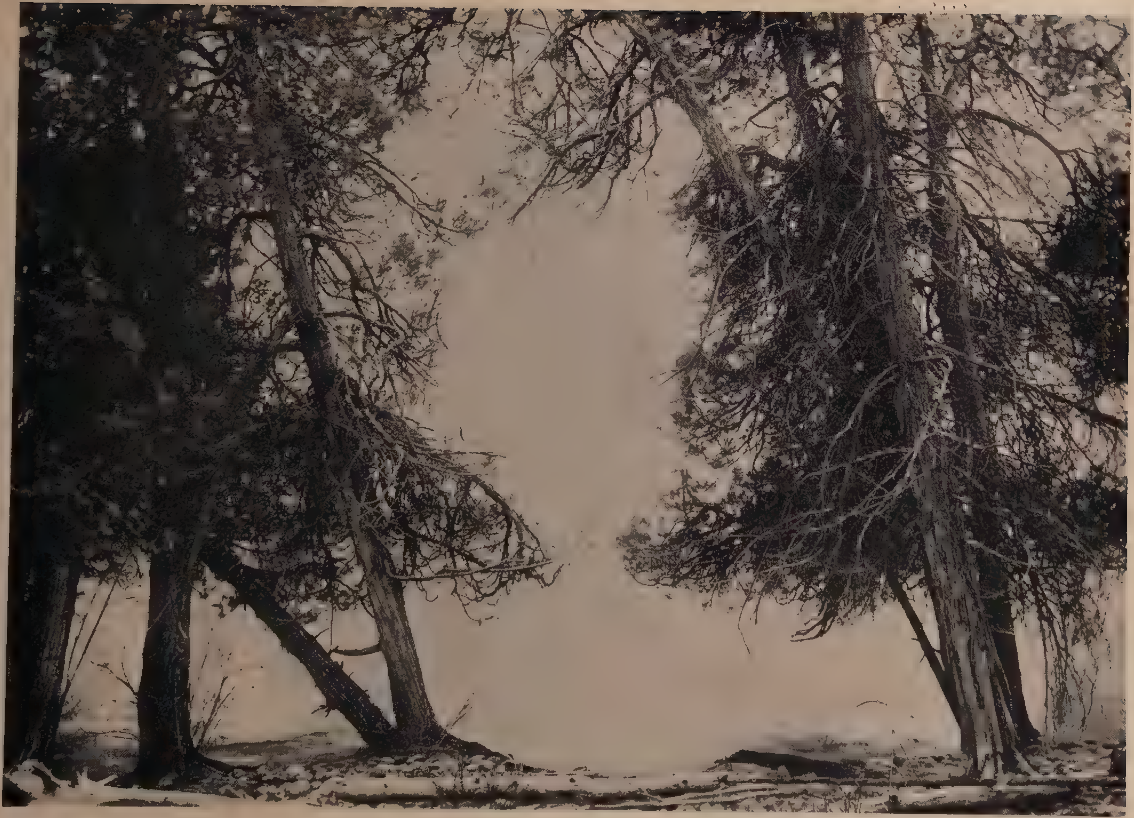

PLATE 10 (p. 43)

Juniperus scopulorum Sarg.

Rocky Mountain juniper on Flathead Lake

1. **Juniperus cómmunis** L.

Common Juniper

In our region a shrub often forming thick mats 2 to 3 feet in depth and covering several square rods, the bark thin, smooth, or on old stems somewhat rough; leaves in whorls of three, keeled, sharp-pointed, rather rigid, ½ inch or less in length, dark green on the lower side, white above; staminate flowers in the axils of the leaves, solitary, the pollen-sacs several under each scale, the ovulate flower of 2 to 3 series of fleshy scales, ovules solitary; fruit ¼ to ⅜ inch in diameter, dark blue with a bloom, containing 1 to 3 seeds, which are ovate, angled, about ⅛ inch long.

This species is found around the world in the northern latitudes. In America it occurs from Greenland to Alaska, and south to Pennsylvania, Nebraska, New Mexico, and California. In the Dominion it is found almost everywhere, but is nowhere abundant (Macoun). In our region it occurs on the North Fork of Old Man River; in the foothills of the Rocky Mountains; in Montana, in Swiftcurrent Pass, on Little Kootenai Creek above Waterton Lake in Glacier Park, at Yellow Bay on Flathead Lake, on Marshall Grade near Missoula, and at Belt Canyon, Helena, Bozeman; in Yellowstone Park, at Lone Star Geyser; in Idaho, near Henry's Lake, in Kootenai County, and the Coeur d'Alene Mountains.

A depressed form of this plant considered by some *J. communis* var. *alpina,* and by others as a distinct species, or as merely a variation or ecological form, is sometimes called *J. sibirica* Burgsd., and occurs frequently throughout the mountains, but varies much with exposure.

2. **Juniperus scopulòrum** Sarg.

Rocky Mountain Juniper. FIG. 8. PLATE 10

A tree 15 to 20 feet in height and 16 inches or less in diameter, the trunk straight, with prominent ridges and low branches, and bark clear, light cinnamon-brown, distinctly cut by wide, shallow furrows, stringy; leaves pale, ashy-green, and marked on the back by a glandular pit, sometimes dark green, appressed, sharp-pointed; staminate flowers small, solitary, or a few together, the pollen-sacs 3 to 6 under each shield-like scale, ovulate flowers nearly globose, with 2 to 3 series of fleshy scales; berry globose, dark blue, with a bloom, ripening at the end of the second season, ¼ to ⅓ inch in diameter, sweet, resinous, with 1 to 2 seeds, which are pointed, grooved, and angled.

This species is found from Alberta and British Columbia to Texas and Arizona; in British America, in the Columbia Valley near Donald,

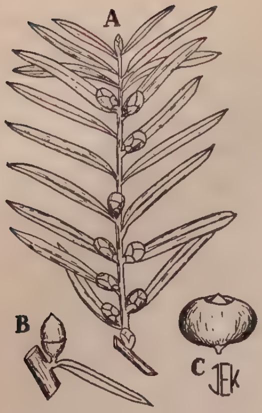

FIG. 9.—*Taxus brevifolia* Nutt. Western Yew

A, branch with flower buds and leaves; *B*, young fruit; *C*, mature fruit. All about natural size.

Taxus brevifòlia Nutt.

Western Yew. FIG. 9

A tree, rarely over 50 feet in height and in diameter 2 feet, often in our region a low shrub, branching freely in broad, flat sprays; leaves ½ inch or more long, sometimes nearly ⅛ inch wide, sharp-pointed, narrowed at the base to the short slender petiole, which is twisted to bring the leaves into horizontal position, green above, paler beneath; flowers as in the genus; fruit in all stages of development in season, ¼ inch or more in diameter, broader than long, the seeds gray, the aril bright scarlet, soft, juicy.

The Western Yew is found from Alaska to California and Nevada, and in the Rocky Mountains to Idaho and Montana; in Idaho, it is to be found along the Priest River and about Lake Waha, and also in the country about Forest; in Montana, it grows along the trail above Lake McDonald in Glacier Park, and in the canyons along the east side of Flathead Lake.

LILIÀCEAE

LILY FAMILY

The members of the Lily Family are mostly herbs, though a few have short woody stems or a tree-like habit. In the family as a whole the leaves are of various forms, often long and narrow, the venation as a rule evidently parallel. The flowers are regular, mostly perfect, solitary or in clusters, the perianth divided into six segments, distinct or nearly so, and with the six stamens inserted below the ovary. The pistil is composed of 3 carpels united into a 3-celled ovary with axile placentation and usually numerous ovules. The seeds are various, the embryo small, embedded in endosperm and bearing a single cotyledon.

This family includes one hundred twenty-five or more genera and over thirteen hundred species, of world-wide distribution.

While the herbaceous species are many in the northern mountains, but one presents a woody form.

The Lily Family as a whole exhibits a great diversity in the size, form, color, habit, and requirements of its species. In many regions they are among the most conspicuous and beautiful of the native plants (*Lilium, Fritillaria, Erythronium*). Besides furnishing a number of edible bulbs (Onion, Garlic, and Camas), some medicinal substances (from species of *Aloe* and *Colchicum*), textile materials (*Yucca, Phormium*), and other products, there are few families that have contributed so richly to the profusion of ornamental plants in cultivation (*Lilium, Tulipa,* etc.).

YÚCCA

Large plants, the stem short-subterranean or tall-woody, with linear or lanceolate and usually rigid, sharp-pointed leaves. The flowers are large, nodding, in a large, terminal, compound cluster either erect or drooping. The perianth is bell-shaped or globular, with six ovate or ovate-lanceolate segments. The stamens also are six in number, with thick filaments and small anthers. The ovary is sessile, 3-celled, containing numerous ovules and bearing a columnar style with three stigmatic lobes. The fruit is a capsule, usually dry, but sometimes fleshy or spongy. The numerous seeds are flattened, horizontal.

About thirty species of *Yucca* are at present recognized, belonging to North America and the West Indies. They are especially southern in their distribution, abounding in the semi-arid plains and deserts of the Southwest and the Mexican Plateau. But one species comes within our range.

This genus exhibits a wide diversity in size and form. Some are simple-stemmed, short or tall, others are widely branched and may reach a height of 40 feet and a stem diameter of 3 to 4 feet, with a wide-spreading crown, as in the case of *Yucca australis* on the Mexican tableland. The Joshua Tree (*Yucca arborescens*), with crooked stem and contorted branches, is a more or less familiar object in the deserts of the Southwest.

A striking feature of the biology of the genus is its relation to a small moth, through the agency of which the pollen is transferred from anthers to stigma in the interest of the development of the larvae, which feed exclusively upon the growing seeds. Wherever the *Yucca* is known the moth is found, and no pollination is naturally effected in its absence.

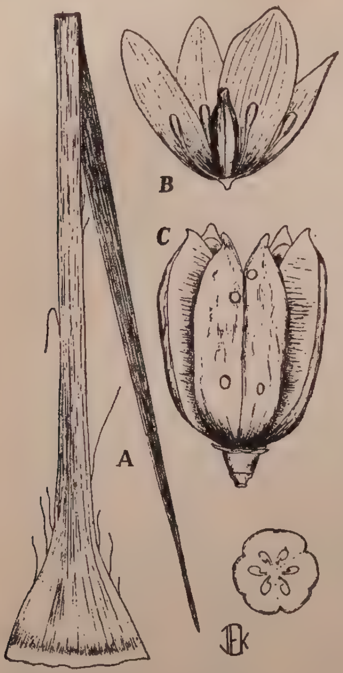

Fig. 10.—*Yucca glauca* Nutt. Spanish Bayonet

A, leaf; *B,* flower; *C,* fruit. All about half natural size. *D,* section of ovary (*Y. radiosa*), ×1½.

Yucca glaùca Nutt.

Spanish Bayonet. Fig. 10

A low, apparently stemless plant, the leaves all basal, 1 to 3 feet long, narrowly linear, usually less than ½ inch wide, rigid, straight, sharp-pointed, the margin bearing thread-like ravelings of its fibrous tissue, the base of the leaf broad; flowers greenish white, 1½ to 3 inches broad in an erect cluster 1 to 4 feet high. The perianth segments are ovate, about 1½ inches long; style green, bottle-shaped; capsule oblong, 2 to 3 inches long, about 1 inch thick, 6-sided, splitting down from the apex at maturity; seeds flat, about ½ inch broad.

This plant is found from the Dakotas and Montana south to Texas and Arizona and in Montana, near Glasgow, Forsythe, Great Falls, and in Park County. It seems to be confined to the eastern side of the Continental Divide.

SALICÀCEAE

Willow Family

The members of this family are all trees or shrubs, varying from dimunitive forms to large forest trees. The twigs are often brittle and sometimes angled and the bark in different members of the group appears in various shades of yellow, red, and brown on young twigs, and may be either smooth or hairy. Ample winter buds are usually formed, the structure of which is characteristic of the genus. The leaves are alternate in position, and those of our species are entire or with marginal teeth of greater or less degree and when mature are borne on distinct and sometimes long petioles. The blades vary in form from heart-shaped to lanceolate and linear. Stipules are commonly present and either fall away early or persist to maturity. The flowers are borne in catkins or aments of simple structure, often pendulous, and consist of one set of members, either stamens or pistils, but never normally both, each kind borne on separate plants. The flowers are without calyx but with a disk or gland in similar position, either cup-like or reduced to separate teeth. Each flower is subtended by a bract, either fringed or entire, and often the whole inflorescence is clothed with soft silky hairs, which, for example, provide the familiar aspect of the pussy willow. Each staminate flower bears, according to the species, from one to many stamens, and the pistillate in each case contains a single pistil, composed usually of two carpels surmounted by a short style and a four-lobed stigma. Within the undivided cavity of the ovary the numerous ovules are attached to two parietal placentae. The small capsules open from above downward by two or more recurved valves, discharging the minute seeds which, provided with an ample appendage of silky hairs, are borne away on the wind. The seeds are without endosperm.

In their biological features the plants of this group command considerable interest. Plants of the Willow Family are very easily reproduced by cuttings, and pieces of stems, and mere twigs readily strike root when placed in water or wet soil. By reason of this fact it is known that certain willows propagate by the shedding of branches, which, falling along water courses or other favorable places, later become established as independent plants. In this connection attention may also be called to the automatic pruning of certain poplars by the excision of twigs in the autumn, to the extent that discarded branchlets of a foot or two in length are freely scattered over the surface of the ground. The full separation of willow stamens and pistils enforces cross-fertilization and also leads to the production of frequent hybrids, which have not only been observed in nature but have also resulted from experimental operations. In the willows the production of nectar in the flowers induces the visits of many insects, which are responsible for the transfer of the pollen. In the cottonwoods, however, this is accomplished by the wind. The seeds have but a short period of viability. Their small size, thin coats and lack of endosperm, and their exposure to the air, resulting from their efficient device for dispersal by the wind, subject them to great danger of desiccation and loss of viability. Usually under favorable circumstances they germinate within twenty-four hours and the seedlings are well under way within a few days. This fact is doubtless associated with the usual habitat of willows and cottonwoods, which is along streams, lakesides, and meadows, or upon such uplands as at seasons of reproduction afford favorable conditions for the prompt germination of seeds and the growth of young plants. The dominance of willows and poplars in the streamside vegetation is probably the result, among other things, of the large demands which they make upon soil moisture and their peculiar seeding habits, which in turn may have become accentuated by their long continuance in situations of this character.

The Willow Family comprises two genera and about two hundred species. With the exception of a few species, all members of this family are natives of the North Temperate Zone, wherein may be noted four principal centers of dispersal: (1) the region of the Bering Sea, (2) Central Europe, (3) the Himalaya Mountains, and (4) Pacific North America. Some of the species and groups of species are found around the world; others are restricted to limited areas.

It appears that the willows prevailed in the Tertiary from the Arctic Zone well into the North Temperate Zone, and in the glacial period arctic willows were dominant in now temperate latitudes. Subsequently in the Tertiary tropical forms invaded the north. The wide distribution of the southern species is presumably due to their facility in vegetative propagation, their habitat near waters, and the agency of ocean currents. Thus in New Zealand in a few years the Weeping Willow, at first introduced, has become widely distributed. The poplars are mainly restricted to the North Temperate Zone, with principal centers in east Asia and Atlantic North America.

Key to the Genera

Flower with a cup-like disk and fringed bract.................. *Populus*
Flower with a peg-like gland and entire bract................. *Salix*

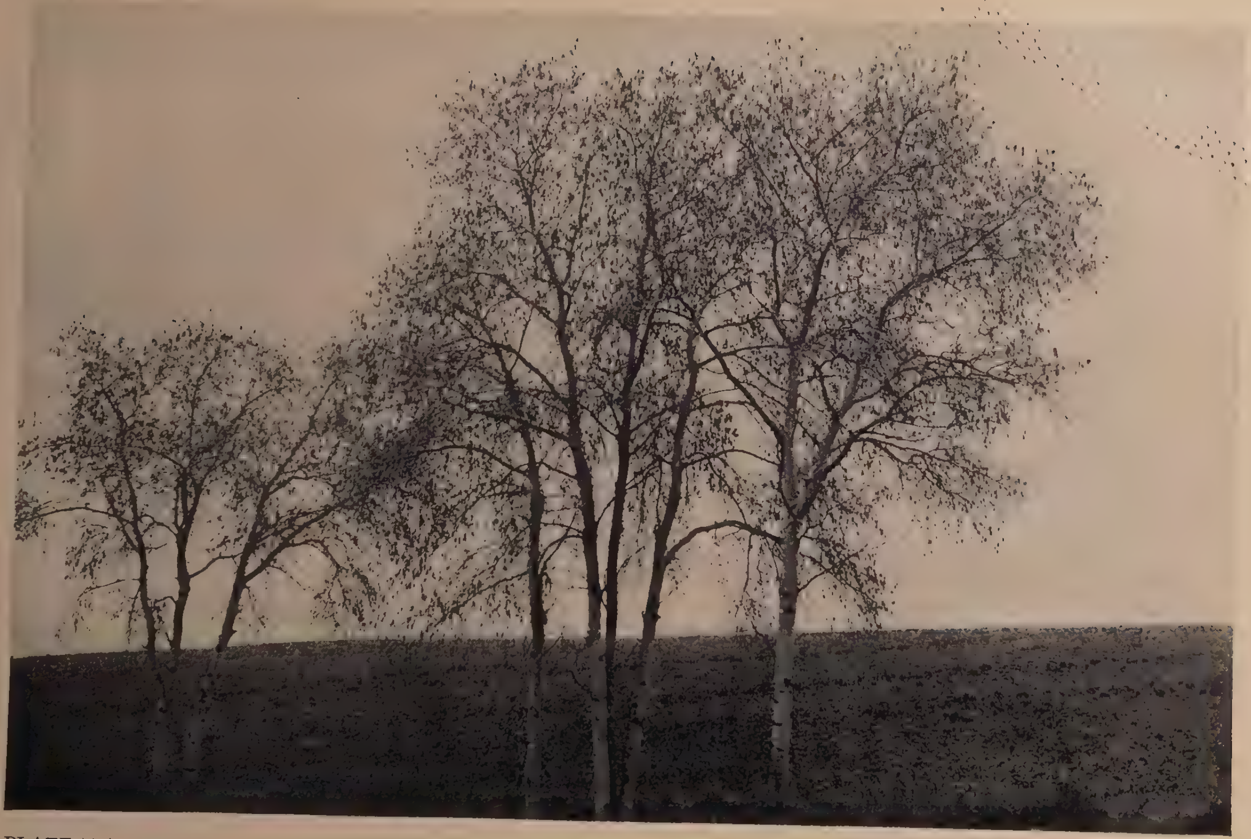

PLATE 11 (p. 52)

Aspens in bloom on the bank of the Bitterroot River in Montana *Populus tremuloides* Michx.

PÓPULUS

COTTONWOOD

Trees with rough or smooth bark on older trunks, usually gray, in some species greenish; on young shoots smooth, pale brown, gray or yellowish and marked by conspicuous half-round or reniform leaf-scars and large, usually resinous buds. The buds are covered with a series of overlapping scales, within which are several delicate inrolled leaves. The mature leaves of our species are heart-shaped, reniform, or lanceolate, borne on long petioles with minute, early deciduous stipules. They are mostly smooth at maturity, shiny above and plainly veined in the pinnate fashion beneath. The flowers emerge before the leaves in mostly pendulous catkins which cover the higher branches in ample festoons. The staminate catkins soon fall after emptying their pollen, but the pistillate bear numerous small ovoid capsules which mature less than ¼ inch in length. Each imperfect flower is borne in a cup-shaped receptacle or disk, the whole subtended by a fringed and hairy bract or scale. The staminate flower has numerous stamens and the pistillate a single pistil of two or more carpels and a corresponding number of stigmas. The fruit produces numerous small seeds with a copious mantle of white hairs, which give to this tree its name, cottonwood.

In the northern Rocky Mountains six species of *Populus* can be recognized with certainty. Three of these seem to have come into the mountains from the east, another apparently has had a western origin, while the sources of the fifth and sixth are doubtful. One of the species is found only on the west slope of the Rocky Mountains, one occurs plentifully on both, while four appear only on the eastern watershed and plains within the region here under discussion. Beside the native species a few others have been introduced, among which may be mentioned the Lombardy, the White, and Bolle's poplars, all brought originally from Europe or Asia.

Numerous fossil species of poplars are known from leaves and twigs in the strata of the Miocene, diminishing in the Pliocene, through the Arctic regions of both hemispheres and including some existing forms.

The cottonwoods have been known from ancient times, as appears in the writings of Pliny, who referred to them under the generic name of *Populus*. They are trees of wide occurrence throughout the Northern Hemisphere, extending from the subtropical highlands to the verge of the Arctic Circle. In our region they are the largest and the most common of the trees along the water courses. They are usually tall and widely branched, possessing a wealth of foliage, which has led to their being widely planted as shade trees. For this purpose they have been especially favored in the newer communities of the semi-arid West, where owing to their hardiness and vigor of growth they have met the requirement as few other trees could do. Owing, however, to their habits of shedding parts of one sort and another and to their short-lived nature they are often supplanted later by more desirable genera. Beside their utility as shade trees and the use which they serve for park and landscape planting, they also have certain commercial uses of a minor sort, such as for pulp and fuel, medicines, and dyes.

KEY TO THE SPECIES OF POPULUS

- Petioles flattened laterally
  - Leaf blades nearly orbicular, 1 to 2 inches wide......... 1. *P. tremuloides*
  - Leaf blades broadly triangular, 2 to 3 inches wide....... 2. *P. Sargentii*
- Petioles round
  - Leaf blades broadly ovate, large
    - Capsule 2-valved .... 3. *P. balsamifera*
    - Capsule 3-valved .... 4. *P. trichocarpa*
  - Leaf blades lanceolate
    - Blades narrowly lanceolate .... 5. *P. angustifolia*
    - Blades broader, rhombic-lanceolate .... 6. *P. acuminata*

1. **Populus tremuloìdes** Michx.

Aspen. FIG. 11. PLATE 11

Trees with smooth, pale-green bark and widely spreading twigs and branches forming a rounded crown. Youngest twigs a reddish-brown with curved oblong or reniform leaf-scars and sharp-pointed buds of two kinds: more slender vegetative buds, and thicker fertile ones. The buds are half an inch or less in length, scarcely resinous, with 3 to 4 exposed scales, which sometimes have ciliate margins; leaves vary from broadly reniform to nearly orbicular, or sometimes approaching the ovate, 1 to 3 inches broad, short taper-pointed at the apex, finely crenulate all around, rounded, truncate or cordate at the

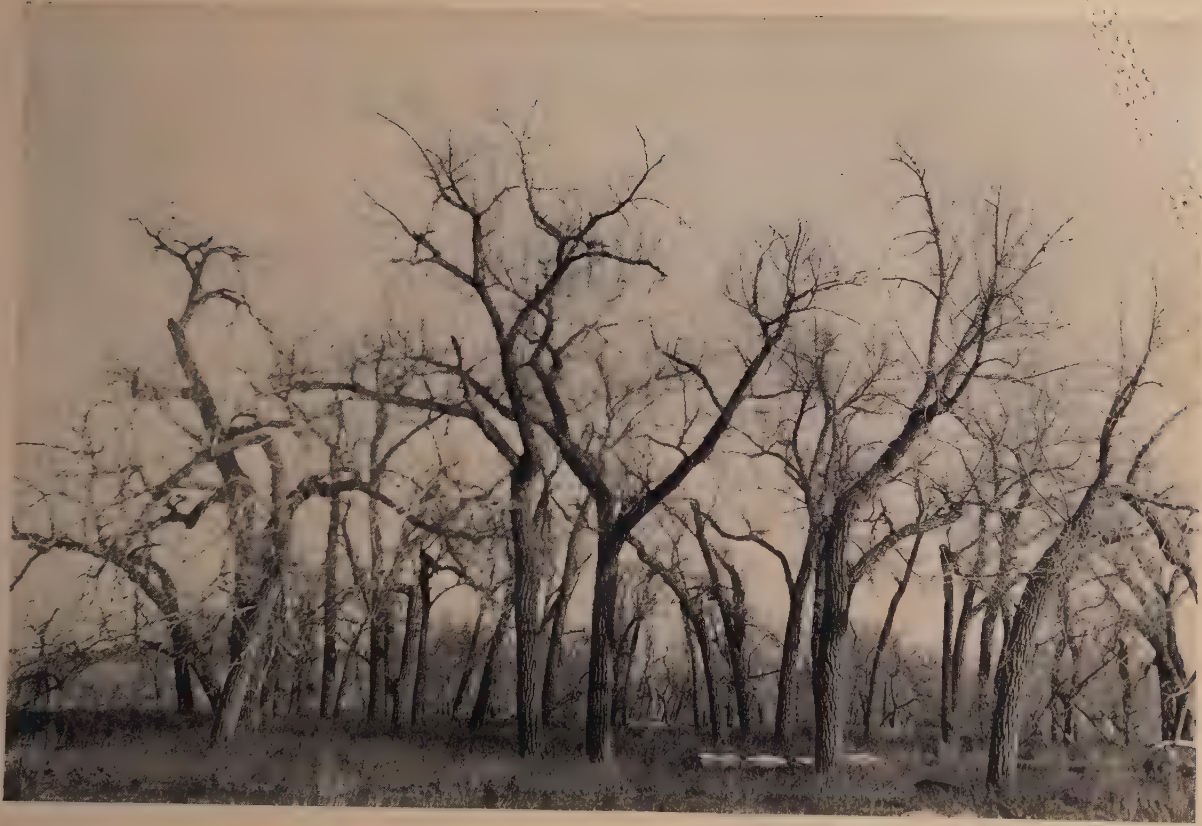

PLATE 12 (p. 53)

Western cottonwood along the Musselshell River

Populus Sargentii Dode

base, smooth above and below; petioles slender and flattened laterally; catkins emerge from winter buds very early in the spring, the staminate 1½ to 3 inches long and ¼ inch wide, the pistillate longer, grayish in color owing to the copious hairs on the scales of the catkins; staminate flowers have 6 to 12 stamens supported by a funnel-shaped disk; pistils bear linear stigmas; capsule conic, acute, 2-valved, and papillose.

The range of the Aspen is from Newfoundland to Alaska, in the East south to Pennsylvania and Tennessee, and in the West along the Rocky Mountains and the Pacific Coast to Mexico. It is not abundant in Montana but is of wide and frequent occurrence as individuals or small thickets here and there throughout that state, notably in several localities about Missoula, along the Bitterroot, Blackfoot, and Flathead rivers and the streams east of the Divide, in the Yellowstone and Glacier National Parks, etc. It is very common and widely diffused northward throughout the British provinces.

The Aspen, or Quaking Asp, is one of the best known of American forest trees. Its yellowish bark and fluttering leaves generally attract attention. In its mature form it usually presents a pleasing outline of rounded top and straight clear stem, the total height reaching 50 to 60 feet. Along the tributaries of the Clark Fork in the Rocky Mountains it is much less common than the Black Cottonwood at ordinary altitudes, but replaces it above 5,000 feet. It shows a tendency to appear in isolated thickets on moist areas on high grassy slopes, and similarly in various other situations.

2. **Populus Sargéntii** Dode

Western Cottonwood. Plate 12

The Western Cottonwood is a large tree with spreading branches and hard, gray, and deeply furrowed bark. The twigs are pale yellow and lustrous and the buds sometimes pubescent, usually glutinous, and a half-inch or less long; leaves broadly triangular, the apex extended into a point, the margin cut into uniform blunt teeth and both surfaces quite smooth at maturity; base of the leaf either truncate or cordate, the petioles flattened on the sides and about as long as the blades; catkins appear in early spring, 3 to 4 inches long, short-stalked, the staminate dense, pistillate open, elongating in fruit to 8 to 10 inches; scales thin, light brown, smooth, and divided at the apex into narrow lobes; stamens 50 or more in each flower, with short filaments and red anthers; pistil in a broad cup, ovary nearly globular, stigmas 3, nearly sessile, expanded; capsule long-ovate, acute, thin-walled, dark green, on stalk ⅛ to ½ inch long. The elongation of the fruiting catkin has given this tree the common designation of Necklace Poplar.

This is by all means the species most abundant and of widest range on the eastern slope of the mountains and plains. It covers the bottom lands of the Yellowstone and Missouri rivers and their numerous tributaries, and in many places is the sole arborescent occupant of the lowest benches. It grows large under favorable conditions, but on the higher plains it becomes stunted and misshapen where its branches are exposed to the full force of the wind.

Populus Sargentii is found from Saskatchewan to New Mexico and from the high slopes of the Rockies on the eastern side to the Dakotas, Nebraska, and Kansas. By some authors it is considered the same as *Populus deltoides* of Marshall, described in 1785; but a few later writers have seen distinctions between the two and have given the specific name *Sargentii* to the western tree.

3. **Populus balsamífera** L.

Balsam Cottonwood

A large tree, expanding above into a wide-spreading crown. The shining, reddish-brown bark of the younger twigs grows gray, heavy, and deeply dissected by channels on older stems. Young twigs round, stout, with very resinous, sharp-pointed buds nearly an inch in length; leaves reach a length of 5 to 6 inches, broadly ovate or lanceolate with broadly rounded base, thin and firm at maturity, hairy when young, becoming with age dark green and shiny above, but beneath paler with conspicuously netted veins, margins bluntly serrate; petioles round; stipules delicate and thin; flowers appear in long-stalked catkins, 4 to 5 inches long; scales often trifid and margined with a fine fringe of narrow lobes; staminate flowers bearing 20 to 30 stamens on an oblique disk, filaments short, anthers red; pistil in a cup-shaped disk, ovary smooth, ovate, with 2 large, nearly sessile stigmas; capsule ovoid, ¼ inch long, 2-valved and short-stalked.

The Balsam Poplar has a northern transcontinental range from Newfoundland to Alaska; southward it extends to New England and the Great Lakes and along the eastern base of the Rocky Mountains to Montana and Wyoming. In Montana it has been collected at Cache Creek, Bozeman, and Emigrant Gulch. In British America it extends to the Arctic Circle on the Mackenzie River; along the Peace River and the Yukon it occupies all the islands and low banks, reaching 150 feet in height and a diameter of 7 feet. Macoun states

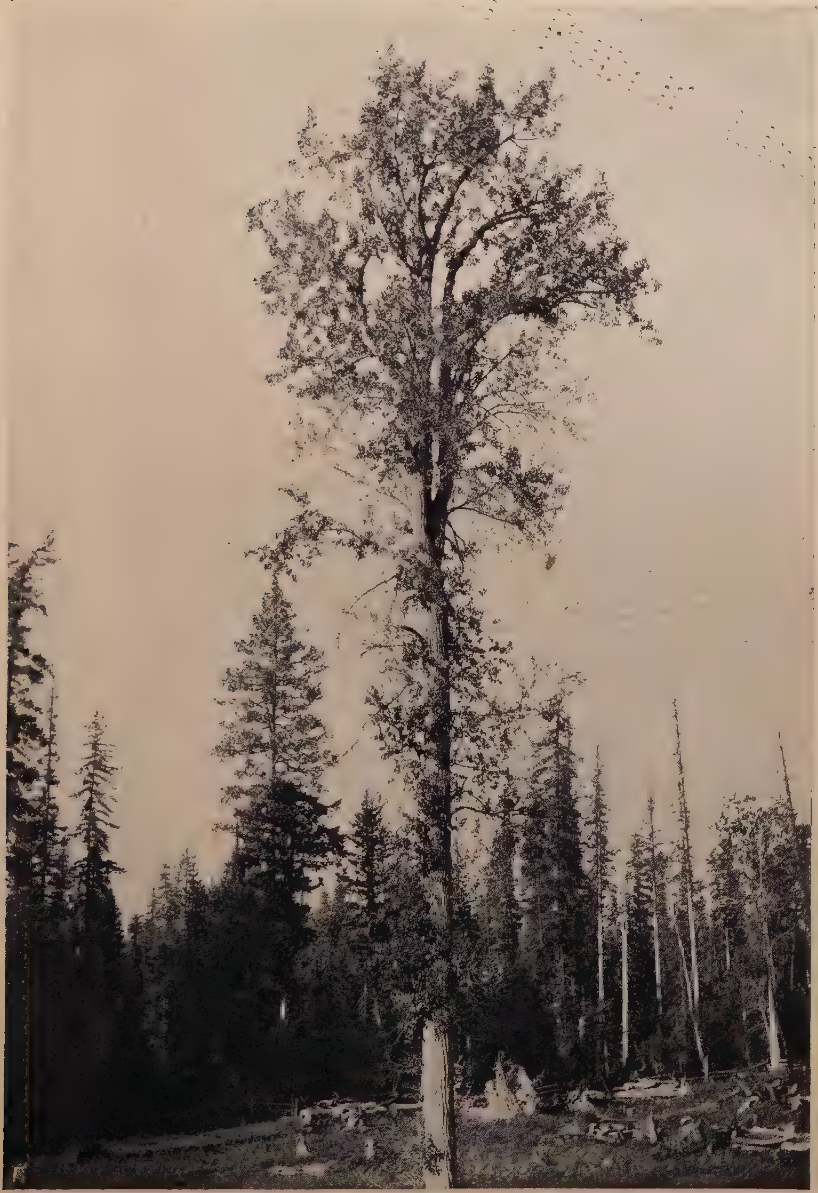

PLATE 13 (p. 55) *Populus trichocarpa* Torrey & Gray

Black cottonwood in July in the Swan River Valley, Montana

that these trees are often carried away by floods to be cast up on the Arctic coast, where they furnish drift fuel for travelers.

This tree was first discovered by Linnaeus in 1753 and has long been known for the medicinal qualities of the gum of its buds, which was sold in the shops of the eighteenth century under the name of Tacamahac, a term which became attached to the tree as its common name. It is known also as Balm of Gilead.

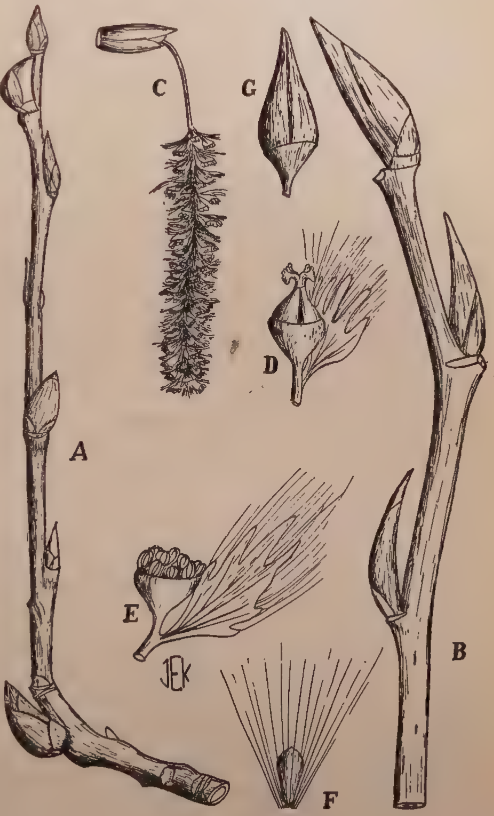

Fig. 11.—*Populus*

A, Populus tremuloides Michx. Aspen; *B, P. trichocarpa* Torr. & Gray. Black Cottonwood; twigs and *C,* inflorescence, natural size; flowers and seeds, *D–F,* ×5; fruit, *G,* ×2½.

4. **Populus trichocàrpa** Torr. & Gray

Black Cottonwood

Fig. 11. Plate 13

A large tree with bark bark in age becoming heavy, dark gray, deeply furrowed between narrow, flat-topped ridges; bark on stems up to 1 foot in diameter usually smooth, green; twigs smooth, greenish-brown, shining with numerous lenticels and semi-circular or reniform leaf scars; buds large, brown, taper-pointed, curved, 2 to 3 scales exposed, resin-coated; leaves in youth of the tree often narrowly lanceolate with cuneate base, but with age changing to a broad ovate with rounded or truncate base, the blade usually about 4 inches long but on the vigorous leading shoots 8 inches or more in length, smooth above and below except along the orange-colored veins of the lower side, where a fine pubescence sometimes occurs, dark green above, and paler beneath, margined with small blunt teeth; flowers in ample catkins, 3 to 4 inches in length; staminate containing 30 to 40 stamens; the pistillate consisting of 3 carpels united into an ovoid ovary, decidedly hairy, with three wide-forking stigmas; fruit a rough-surfaced, blunt capsule.

The Black Cottonwood is said to grow to a height of 200 feet, but in the Rocky Mountains hardly reaches more than 100. In its best form it has a tall, straight cylindrical stem and a crown of wide-spreading branches. The young tree has a slender conical form, which gradually gives place to the irregular branching and rounded outlines of maturity.

This cottonwood is the most common of all trees along streams on the west slope of the Rockies in Montana and northern Idaho. Its range is from Alaska to southern California, where it was first collected on the Santa Clara River in Ventura County and described by Torrey and Gray in 1852. In British America it is common on the Columbia River at Donald, in the low valleys of the Selkirk Mountains, the valley of the Fraser River, and northwest to the Yukon.

5. **Populus angustifòlia** James

Narrow-leaved Cottonwood

A tree, reaching a height of 60 to 70 feet and a stem diameter of 15 to 20 inches; bark on old trunks thick, rough, and fissured, especially near the base, but smoother above and diminishing to pale green on the rounded twigs; buds ovoid, pointed, and covered with resin, the terminal ones measuring an inch or less in length; leaves mostly lanceolate in outline, often narrow, 2 to 4 inches long, thin, firm, blunt at the apex and narrowed or rounded at the base, bluntly serrate, smooth at maturity both above and below; petioles round, usually less than a quarter the length of the blade; flowers appear in short, densely flowered catkins; scales broadly obovate, thin, brown, and cut into narrow lobes; staminate flowers usually bear less than 20 stamens in a cup-like disk; pistils with oblique, dilated stigmas and ovoid, usually 2-lobed capsules on short stalks; fruiting catkin reaching 2½ to 4 inches in fruit; capsules broadly ovate, often contracted above the middle, less than ¼ inch long.

This tree, which has sometimes been considered a variety of the Balsam Poplar, is reported from Dakota to the Yukon, and southward through Nebraska, Utah, and Nevada to northern Mexico. It occurs in the Beaverhead and Gallatin valleys in Montana, but it is doubtful whether it is found at all in our region on the Pacific drainage. It has been collected at Livingston, Boulder Basin, and Barratts, Montana, and is reported by Macoun along the Milk and Belly rivers in southern Alberta and on Bow River from Blackfoot Crossing to the Rocky Mountains.

It was described in 1823 by James in the scientific reports of Long's expedition to the Rocky Mountains in 1819–1820.

6. **Populus acuminàta** Rydb.

Rydberg's Poplar

A tree, reaching 40 feet in height and a diameter of 12 to 18 inches, with round-topped head. Twigs rounded, greenish-yellow, with somewhat elevated leaf-scars; winter buds ovate, acute, dark, resinous, ⅛ inch or less long; on older stems bark dark gray to brown, thin, divided by grooves into broad, flat ridges; leaves rhombic-lanceolate, taper-pointed at the apex, round or wedge-shaped at the base, blade 2 to 4 inches long, 1 to 2 inches wide, margin crenate-serrate along the sides, but nearly entire at apex and base, smooth and green on both sides, darker above; catkins slender, 2 to 3 inches long, pistillate reaching 4 to 5 inches in fruit; scales thin with narrow lobes; stamens numerous on an oblique, thin disk; pistil in a deep, cup-shaped disk, with broad ovary, narrowed above to the large, cut-lobed stigmas; fruit stalked, long ovate, thin-walled, ⅓ inch long, usually 3-valved and short-stalked.

Its range is from Saskatchewan to Texas, probably mostly on the eastern slope of the Rockies.

SÀLIX

Willow

The willows are trees or shrubs with wide range of form from diminutive creeping plants to large forest trees. On old stems the bark is usually hard and firm and rough, but on branches and young stems, even those of considerable size, it is thin, smooth, and in color varies from green to brown or red. The twigs are usually smooth, lustrous, and colored in red or yellow hues; some are brittle, separating from the branch readily at the point of juncture, others are long, slender, and tough. They are rounded and not angled, and marked by **U**-shaped or crescentic leaf-scars. The winter buds of some species are small, of others prominent, each covered with two layers, the inner adhering closely to the outer and formed of a pair of stipules. No overlapping of scales appears externally on the bud. The leaves of willows are usually narrow, lanceolate, oblong or linear, on short petioles, attended by more or less persistent stipules; the margin is often toothed and the surface may be smooth or hairy. The flowers are borne in catkins on short lateral twigs, either accompanied by leaves or without them. In the latter case the catkins are said to be naked. In some cases they emerge from the winter buds before the leaves, in others they appear at the same time. The catkins are made up of numerous very small flowers each subtended by a small scale, entire, and usually hairy. This last feature produces the "pussies" of some of the early flowering willows. Each flower bears but one set of organs, either stamens or pistils; each staminate flower in most cases bears 2 stamens, though some species have three or five. The pistils are slender structures, tapering toward the outer end, where each divides into two stigmas, which are in turn parted into two lobes each. The flower of either kind bears at the base a small nectarial gland, which is the morphological equivalent of the cup or disk of the poplars. The flowers are visited freely by insects of many kinds and the pollen is doubtless distributed largely by their agency. The fruit ripens as a narrow conical capsule, which splits down from the apex into two valves, exposing the minute seeds, which, owing to their abundant cotton-like coma, are borne freely away on the wind.

The willows comprise a large group of plants. Authors disagree as to the number of species, but probably about two hundred are known to science, of which about fifty are accredited to the northern Rocky Mountains. While the willows extend their range to the far north, they grow larger in warmer latitudes. They are found mostly in the Northern Hemisphere, although a few are found in the Southern. They occur likewise at all elevations from sea-level up to the snow-line on the highest mountains. They differ much in form and habits, and, while they are the most characteristic occupants of stream sides and wet lands, some also are upland species; some grow in the open while others normally form in extensive masses or low thickets. Besides the numerous native species, some have been introduced from Europe and Asia and form more or less familiar objects throughout the country, among which may be mentioned the Weeping Willow. Many fossil species are known from the Tertiary strata of different periods in Europe and America and in the Arctic regions, and in pre- and post-glacial formations of Europe remains of several existing species have been found.

Many species of willows are recognized readily by the various features of the leaves and twigs and the size and habit of the plant, but owing to the great degree of fluctuating variability in some of their structures, their identity is often open to question, and considerable confusion obtains in the classification of the group. Even the minute characters of the flowers and fruit are often quite insufficient to separate the species with certainty.

The willows have a limited number of uses, the most important of which is the use of slender shoots of certain kinds in basketry and the manufacture of wicker furniture. The light tough wood is used to some extent in turned articles and for finer grades of charcoal. Willows have been used frequently as soil binders along rapid streams where their fibrous roots hinder the erosive action of the current.

Key to the Main Groups of Salix

- Stamens more than 2 in each flower
  - Leaves without glands on the petioles I
  - Leaves with glands on the petioles II
- Stamens normally 2 in each flower
  - Capsules mostly smooth
    - Scales of the catkin pale yellow; leaves linear III
    - Scales of the catkin dark
      - Erect or ascending shrubs
        - Leaves glabrous IV
        - Leaves more or less hairy V
      - Small creeping plant VI
  - Capsules hairy
    - Filaments hairy, leaves narrow III
    - Filaments usually smooth, leaves various
      - Capsule beaked and distinctly stalked
        - Stigmas sessile, leaves linear to elliptic VII
        - Style very short, leaves larger, linear-lanceolate to obovate VIII

Capsule with short beak or none, usually sessile
Style clearly present
Catkin usually sessile and naked.................. IX
Catkins on leafy peduncles........................ X
Style wanting, catkins naked....................... XI

Key to the Species of Salix

I. Trees with smooth yellow bark on the younger branches, smooth lanceolate leaves and several stamens in each flower. Capsule small, stalked, smooth.
1. *S. amygdaloides*

II. Tall shrubs with dark brown bark on the younger branches, leaves lanceolate, long taper-pointed and with glandular petioles. Five stamens in each flower. Capsule large, long, smooth.

Leaves lustrous, glabrous, leathery....................... 2. *S. lucida*
Leaves pubescent when very young, glaucous beneath....... 3. *S. lasiandra*

III. Shrubs or small trees with gray or brown bark and slender twigs. Leaves narrow, with minute teeth or entire. Catkins on leafy twigs. Capsule in most species smooth.

Leaves linear, mostly silvery-pubescent, at least when young
Leaves from ⅛ to ⅝ inch in breadth
Leaves nearly smooth in age...................... 4. *S. fluviatilis*
Leaves permanently silky, capsule sometimes hairy 5. *S. argophylla*
Leaves usually much narrower..................... 6. *S. exigua*
Leaves narrowly oblanceolate, closely denticulate
Twigs dark brown, lustrous........................ 7. *S. melanopsis*
Twigs hoary-pubescent .... 8. *S. sessilifolia*

IV. Shrubs with numerous closely crowded stems and slender brown or yellow twigs. Leaves linear-lanceolate to broadly oblanceolate, acute to long acuminate, glabrous at least in age, and usually stipulate. Buds yellowish or brown. Catkins appearing with or before the leaves, sessile or on short leafy or bracted peduncles. Scales brown. Capsules smooth, stalked, styles evident

Mature leaves glabrous, not densely hairy beneath
Capsule distinctly stalked
Capsules pale brown or yellowish
Leaves oblanceolate, pale green above.... 9. *S. mackenziana*
Leaves lanceolate, dark green above...... 10. *S. cordata*
Capsules dark .... 11. *S. myrtilloides*
Capsule sessile, or short-stalked................ 12. *S. pseudomyrsinites*
Mature leaves sometimes white-hairy beneath with short, gray pubescence....................... 13. *S. lasiolepis*

V. Shrubs with densely crowded stems and dark twigs, leaves usually broad beyond the middle, slightly serrulate or crenate, more or less hairy, at least above, and stipulate. Catkins leafy or bracted at the base (except *Tweedyi*), emerging with or before the leaves, scales hairy. Capsules ovate or beaked.

Young leaves and twigs mostly smooth
  Catkins short, on leafy branches.................... 14. *S. monticola*
  Catkins longer, nearly sessile...................... 15. *S. curtiflora*
Young leaves and twigs pubescent
  Capsule ¼ inch long, or less
    Leaves glaucous beneath........................ 16. *S. Barclayi*
    Leaves not glaucous beneath
      Stipules large .... 17. *S. commutata*
      Stipules small or none...................... 18. *S. Wolfii*
  Capsule ¼ inch long, or more...................... 19. *S. Tweedyi*

VI. Low creeping shrub less than 4 inches high. Leaves small, entire, glabrous. Catkins 2- to 4-flowered. Capsule smooth.
20. *S. Dodgeana*

VII. Shrubs 6 to 15 feet high, with spreading, slender twigs. Leaves linear to elliptic, mostly entire, stipules on flowering shoots small or none. Catkins emerging with the leaves; the pistillate on leafy stems. Capsules long-pediceled.

Twigs dark, with a bluish bloom...................... 21. *S. Geyeriana*
Twigs brown, hairy when very young................... 22. *S. Bebbiana*

VIII. Shrubs. Leaves large, linear-lanceolate, lanceolate-oblong to obovate, entire or slightly crenulate-dentate, strongly pubescent, or smooth when old. Catkins appearing with or before the leaves, usually sessile and naked. Scales long-hairy. Capsule hairy, pointed.

Catkins, at least the staminate, naked
  Leaves narrowly lanceolate........................ 23. *S. petiolaris*
  Leaves not narrowly lanceolate
    Leaves mostly lanceolate or oblong.............. 24. *S. discolor*
    Leaves mostly oblanceolate or obovate........... 25. *S. Scouleriana*
Catkins on short bracted peduncles.................. 26. *S. Lemmoni*

IX. Erect shrubs with long twigs, varying from reddish-brown to green or yellow. Leaves usually oblanceolate, but varying to lanceolate or oblong, silvery-hairy, at least beneath, finely toothed or entire. Catkins on short, sometimes bracted stems. Scales hairy. Capsules hairy, short-stalked.

Catkins about ½ inch broad, ovary medium
  Leaves usually obovate
    Twigs white-hairy .... 27. *S. alaxensis*
    Twigs minutely hairy...................... 28. *S. Barrattiana*
      Leaves oblong-lanceolate or oblanceolate
        Leaves strongly reticulate beneath...... 29. *S. candida*
        Leaves not strongly reticulate beneath.. 30. *S. bella*
Catkins less than ⅜ inch broad, ovary very short
  Leaves broadly obovate
    Twigs minutely hairy, stamens 1............ 31. *S. sitchensis*
    Twigs smooth, stamens 2.................... 32. *S. Drummondiana*
  Leaves lanceolate to oblong or oblanceolate
    Twigs not coated with bluish bloom
      Fruit silvery-pubescent .... 33. *S. argyrocarpa*
      Fruit not silvery......................... 34. *S. arbusculoides*

Twigs coated with bluish bloom
Catkins usually naked.................... 35. *S. pellita*
Catkins usually sessile, rarely bracted...... 36. *S. subcoerulea*

X. Mostly low alpine shrubs, usually with small elliptical or oblong leaves: catkins appearing on short, leafy stems at same time as the leaves. Scales hairy, more or less brown. Capsules hairy.

Catkins on leafy twigs
More or less erect shrubs
Leaves grayish-hairy on both sides, less on the upper .... 37. *S. glaucops*
Leaves becoming smooth with age, at least above
Leaves oblong or oblanceolate
Leaves entire-margined............... 38. *S. desertorum*
Leaves finely serrulate................ 39. *S. McCalliana*
Leaves linear-lanceolate .... 40. *S. saskatchewana*
Depressed, trailing shrub....................... 41. *S. petrophila*
Catkins usually naked
Leaves oblanceolate, strongly veined beneath..... 42. *S. Nelsonii*
Leaves elliptic or ovate, not strongly veined...... 43. *S. chlorophylla*

XI. Low alpine shrubs, with smooth, reddish-brown twigs. Leaves oval or nearly orbicular, marked by strong reticulations beneath, margin entire, or nearly so. Catkins on naked peduncles opposite the last leaf. Capsule short, sessile, hairy.

Leaves more than 1 inch long, distinctly hairy........... 44. *S. vestita*
Leaves less than 1 inch long, mostly smooth.............. 45. *S. reticulata*

1. **Salix amygdaloìdes** Anderss.

Peach-leaved Willow

Trees, with straight, slender, and tough twigs; bark on twigs and younger branches yellow or brown, changing in age to gray, and marked by many fissures and narrow ridges; winter buds small, ovate, lustrous; leaves, borne on rounded petioles half an inch or less in length, are usually lanceolate in outline, 2 to 3 inches long, less than 1 inch wide, with a broadly wedge-shaped base and slender point, margin finely serrate, surface smooth and bright green, the yellowish midrib and bright veins showing plainly beneath; stipules fall almost with the first appearance of the leaf, but on vigorous shoots may persist as reniform, serrate appendages; catkins slender, slightly curved, terminal on short leafy stems; scales of the catkin yellow, densely hairy within but much less so on the back, pointed, oblong or ovate, narrower in the pistillate than in the staminate cluster, and in the former case falling early; staminate flowers bear several stamens with equal filaments; pistils slender, smooth, on long pedicels and with slender style; capsule yellow, smooth, less than ¼ inch long.

In our region the Peach-leaved Willow attains a height of 15 to 25 feet and a stem diameter of 10 to 12 inches, though in warmer latitudes it may reach a height of 60 feet or more and a diameter of 18 inches or upwards. It grows in distinctly tree form with short trunk and rounded crown.

This species occurs along streams and ditches and other moist places over a large part of North America. It is found from the valley of the St. Lawrence to British Columbia and southward to New York, Ohio, Missouri, Texas, and Oregon, and through the Rocky Mountains to New Mexico. Collected in Montana at Great Falls, Columbia Falls, and in the Deer Lodge Valley and other places, usually below 4,000 feet altitude.

2. **Salix lúcida** Muhl.

Shining Willow

A shrub, occasionally a tree; twigs yellowish-brown, becoming darker with age, at first hairy but later becoming smooth and shiny; winter buds smooth, pointed, about ¼ inch long; leaves lanceolate to nearly ovate, pointed, sometimes very long-pointed, 3 to 6 inches long, ½ to 2 inches wide, finely serrate with mostly glandular teeth, both surfaces of the leaf smooth at maturity, the lower paler and at first hairy, the upper dark green; petioles hairy, usually less than ½ inch long, as a rule bearing stalked glands; stipules glandular-toothed, broad, deciduous or persistent; catkins on short leafy branches of the season, 1 to 2½ inches long, their axes hairy; scales blunt, sometimes toothed; usually 5 stamens in each staminate flower; filaments slightly hairy below; pistils with narrowly ovoid ovary and short, nearly sessile stigmas; capsule narrow, smooth, much longer than the pedicels.

The Shining Willow is usually a shrub but often assumes tree form, 20 to 25 feet in height and 8 to 10 inches in stem diameter. It occurs usually in wet soil and is conspicuous by the luster of its leaves.

One of the most generally diffused of all North American willows, extending throughout Canada from Lake Huron to the Rocky Mountains and the Columbia River, north about Hudson Bay and to latitude 65° N. at Fort Franklin on the Mackenzie River, and south to the latitude of Nebraska.

Another willow, by some authors considered a distinct species under the name *S. serissima* (Bail.) Fern., reaches the eastern slope of the Rockies in Canada and Montana. It is generally described as a shrub 10 to 13 feet in height, with olive-brown branches and smooth, lustrous reddish-brown or yellow-tinged twigs. It differs from *S. lucida* especially in the much more hairy scales of the inflorescence and its fruiting late in the season. It was known as a variety of *S. lucida* until described by Fernald as a species under the name given above.

3. **Salix lasiándra** Benth.

Black Willow

Tree, with trunk forked low and widely leaning branches; twigs vary from yellow to dark brown and from smooth to dense with matted pubescence, even on the same branch. On old trunks the bark becomes dark gray, rough and longitudinally fissured. Winter buds ¼ to ½ inch long, flattened toward the stem, rounded or angular on the base, curved out at the top, smooth or hairy; leaves mostly 3 to 4 inches in length, ½ to ¾ inch wide, but on strong shoots may reach 6 to 8 inches in length and a width of 2 inches, usually lanceolate with long-tapering point, margin finely serrate, the teeth often glandular, especially at the base of the blade; petioles ¼ to ½ inch long, conspicuously glandular at the top; stipules half-moon-shaped or ear-like, glandular-toothed and persistent; blade green, somewhat paler beneath, usually smooth, though perhaps silky-hairy when quite young; catkins appearing with the leaves, terminal on short leafy twigs, staminate 2 to 3 inches long, ½ inch wide or more, the pistillate somewhat shorter; scales of the catkin relatively large, oblong or oblanceolate, hairy; stamens 5 or more in each flower, filaments bearded; ovary lanceolate; stigma sessile, capsule ovoid conic, ⅙ inch long, on pedicel half the length of the capsule.

The original description of *Salix lasiandra* was written by Bentham from a specimen collected by Theodor Hartweg on the banks of the Sacramento River in 1837. It is now known to range from British Columbia to southern California and east to Montana, Wyoming, and Colorado. Varieties of *Salix lasiandra, caudata* and *Lyallii,* are sometimes known as species, *S. Fendleriana* and *S. Lyallii,* respectively. They differ mainly in the size and other more or less fluctuating characteristics of the leaves. Whether or not the three should be regarded as distinct species is at present a matter of opinion. Comparison of material from various sources and of descriptions by different authors is not very convincing as to the validity of the varieties cited, much less that of the species. If the range of *S. lasiandra* is extended to include that of its alleged varieties, it should be stated as reaching from the Yukon to California and east to Alberta, North and South Dakota, Colorado, and New Mexico.

The Black Willow has an altitudinal range up to 6,000 feet. In favorable situations in the better parts of its area it becomes a tree 50 feet in height and 2 feet in diameter. In Montana it is common along open river bottoms, and has been collected in the Flathead Valley, on Lolo Creek in the Bitterroot Mountains, and along the Bighole River below Ralston.

4. **Salix fluviátilis** Nutt.

Sandbar Willow

A shrub or tree with slender, supple, brownish twigs; leaves linear, 2 to 4 inches long, ¼ inch wide, more or less, acute at base and apex, margin wavy, with small, somewhat distant, sharp-pointed teeth; glabrous, green above and below; petioles short; stipules none (except probably in very young leaves); catkins narrow, solitary, and short, hairy, emerging with the leaves, terminal on short leafy twigs; scales oblong, brown, and densely bearded below; stamens 2 in each flower; ovary smooth, lanceolate, stalked, and with 4 sessile stigmas; capsule smooth.

The Sandbar Willow is a shrub of 6 to 12 feet in height, or a tree 20 to 30 feet high. It is widely distributed over the western part of the United States. It is a frequent plant along streams and ditches and on sandbars and deltas, and is common everywhere in western Montana, most abundant at altitudes below 4,000 feet. It occurs at Castle Mountain and Beavermouth in the Canadian Rockies.

The section of the willows to which this species belongs (including also the following 5 to 8 inclusive) is an entirely American group which extends from near the Arctic Circle to Central America and across the continent through the northern states and Canada. It prevails chiefly west of the Rocky Mountains, where it finds its fullest development and greatest variation in form and structure. "Eastward it declines," according to Mr. Bebb, "in vigor and variability until on the Atlantic Coast it is of rare occurrence from New Brunswick to the Potomac. Clearly marked as are the limits of the group, it presents no lines of cleavage within by which it can be satisfactorily divided."

Much discussion has centered around this species. Some authors have assigned it a wide range from Quebec to the Pacific Northwest and from the Arctic Circle to Virginia, New Mexico, and Lower California. Others have regarded it as very local, in the neighborhood of the confluence of the Columbia and Willamette rivers, where it was first discovered by Nuttall about 1835. At the same time Nuttall collected several other willows to which he assigned various names. Subsequent studies by various authors have either retained these as species or have regarded them as varieties, but in all the literature there is prevalent a vagueness and uncertainty as to the identity of Nuttall's species. With reference, however, to *S. fluviatilis,* Nuttall himself reported finding it along the Snake River in southeastern Idaho, where, as he says, it grew plentifully mixed with and much resembling *S. longifolia* Muhl., which was common on islands and sandbars of the Missouri and Mississippi. He says further that the two are common along all streams west to the Columbia. Whether these two can be considered the same or distinct cannot be determined here, but by some they are considered the same, and it may be added that the marks cited as distinguishing the two are apparently inconstant.

Several other species (?), by some regarded as at most varieties, have been known since the publication of Nuttall's *Sylva.* These are *S. argophylla* Nutt., *S. exigua* Nutt., *S. sessilifolia* Nutt., and *S. melanopsis* Nutt.

One of the willows most often confused with *S. fluviatilis* is *S. longifolia.* By some authors they are considered distinct, by others the same. Nuttall considered them different and thought he found the two growing intermingled along the Snake River. To some who accept the distinctions between the two species, *S. longifolia* is widely distributed through the plains region and the northeastern states, but is regarded as not reaching the Rocky Mountains, the latter region being occupied by several varieties, viz., *angustissima, pedicellata,* etc. The critical marks differentiating the two species are vague and indefinite and intergrade to such an extent that confidence fails, in the comparison of much material from many places and determined by different botanists, to fix with certainty the line of demarcation between them. Granting, however, the validity of the two species, the marks which are cited as determining *S. argophylla* and several other closely related so-called species are even less satisfactory, either when compared with *S. fluviatilis* or among themselves.

5. **Salix argophýlla** Nutt.

Silvery Willow

A shrub, 3 to 15 feet high; leaves linear or nearly lanceolate, 1½ to 2 inches long and about ⅛ inch wide, acute, nearly sessile, entire, silvery-silky, with soft hairs on both sides; stipules small, linear, falling early; catkins relatively late on branches bearing 4 to 7 leaves, the staminate small, narrow; scales lanceolate, smooth on back, hairy on margins and within; 2 stamens in each flower, filaments densely hairy; pistil hairy, stigma sessile; capsule lanceolate.

Nuttall found this willow on a tributary of the Snake River in western Idaho. Whether this is regarded as a species identical with or different from *S. fluviatilis,* its silvery pubescence marks it conspicuously along many of the Rocky Mountain streams where every breeze flashes the pale foliage of this tree among tops of darker green.

Present views extend the range of this species from Montana to Texas and from Washington to California.

6. **Salix exígua** Nutt.

Slender Willow

A shrub or tree, 5 to 15 feet high; branches reddish-brown and smooth; leaves narrowly lanceolate, 1 to 5 inches in length, acute, nearly entire, closely sessile, yellowish or hoary silky, becoming smooth above with age; stipules none or minute; catkins on leafy peduncles, the staminate 1 to 2 inches long, the pistillate shorter; scales of the former oblong or obovate, of the latter broadly lanceolate; stamens 2, filaments hairy below; pistil slightly silky-hairy when young; capsule less than ¼ inch long, elongate ovoid, smooth, sessile.

The Slender Willow occupies sandbars and like situations with *S. argophylla* from Saskatchewan to Oklahoma and west to British Columbia, Oregon, California, and Arizona. It was originally discovered by Nuttall in the same locality as *S. fluviatilis,* near the mouth of the Willamette River. Nuttall states in his *Sylva* that it is a very similar but smaller species, but with narrower leaves, at all times gray and silky, the serrulations mostly wanting, the capsules smaller and not stalked.

7. **Salix melanópsis** Nutt.

Dusky Willow

Shrub or tree, 12 to 15 feet high; twigs and branches from dark chestnut-brown to nearly black, hence the name; leaves also dark, lanceolate to elliptic or oblanceolate, 1½ to 3 inches long, ¼ to ½ inch wide, acute at the apex, base variable, minutely serrate, pubescent when young, usually becoming smooth with age, somewhat glaucous, sessile or nearly so; stipules lanceolate, small; catkins linear, flexuous, on branches bearing 5 to 6 leaves; scales linear, oblong, brown; stamens 2 in each flower, filaments hairy below the middle; pistillate catkins short, nearly smooth; pistils lanceolate, smooth, with short, spreading, nearly sessile stigmas; capsule nearly or quite sessile.

The Dusky Willow was first discovered by Nuttall in Idaho, near Fort Hall. Its range is now believed to be from the western slopes of the Rocky Mountains in Montana and Idaho to British Columbia, Washington, and Oregon. It occurs in the Canadian Rockies at Field and at Emerald Lake.

8. **Salix sessilifòlia** Nutt.

Sessile-leaved Willow

A shrub or small tree, 6 to 30 feet in height; twigs dark brown; leaves membranous, elliptical, 1 to 5 inches long, acute at both ends, obscurely and remotely denticulate, hoary with long pubescence when young, smooth when mature, closely sessile; catkins often 3 together, 3 to 4 inches long, on lateral leafy shoots, very densely flowered, pistillate somewhat smaller than the staminate; scales oblong or obovate, somewhat narrower in the pistillate catkin, rounded at the apex, nearly or quite smooth; stamens 2 in each flower, filaments hairy below the middle; pistil silky-hairy when young, style evident; capsule lanceolate, smooth, closely sessile.

The Sessile-leaved Willow was discovered by Nuttall, with the other species mentioned above, near the mouth of the Willamette River in Oregon. It is now reported from Washington to California and east to the Rocky Mountains. Nuttall states that it also closely resembles *S. fluviatilis* and that it is a very showy plant, especially in flower. It is described as very leafy, hoary with velvety pubescence, the points of the leaves rigid and sharply acute.

9. **Salix mackenziàna** Barratt

Diamond Willow

A shrub, 6 to 12 feet high, with spreading, lustrous twigs; leaves oblanceolate or narrowly obovate, sometimes lanceolate, 1¼ to 3 inches long, ⅛ to ¾ inch wide, mostly taper-pointed at the apex, wedge-shaped to rounded at the base, entire or serrulate, light green above, glaucous beneath, netted venation conspicuous on both sides;

stipules half-moon-shaped, entire to serrate dentate; catkins appearing with the leaves on leafy twigs, the staminate ¾ to 1½ inches long, the pistillate ¾ to 2½ inches long, wide, open in fruit; scales oblanceolate, brown, thinly hairy; capsule green, ovate-conic, less than ¼ inch long.

The Diamond Willow is reported on stream banks and wet places from Wyoming to the British possessions and west to California and Nevada. It is found in the Yellowstone National Park and has been collected in Montana on Boulder River and near Havre and Malta and in the Canadian Rockies on Kicking Horse Lake and the Mackenzie River. Some would extend the range to include Manitoba, South Dakota, and southern California.

This species was first brought to notice by Barratt in Hooker's *Flora Borealis Americana,* published about 1839. It was then known as a variety of *S. cordata* and is chief among a number of strains closely related to that species. In its extreme departure this form bears leaves lanceolate or oblanceolate, with tapering point, smooth, dark green above, and paler but not glaucous beneath, the margin at first finely and obscurely serrulate, but at length nearly entire. The petioles are slender and the stipules small but rarely absent. The staminate catkins are sessile. The brownish tips of the scales show distinctly in the white wool which completely clothes the axis of the inflorescence. In each staminate flower are two stamens with slender filaments. Fertile catkins, according to Bebb, are usually destitute of much pubescence on the axis in the most typical material, though on intermediate forms it appears quite abundant; they show short but distinct peduncles, often with several small leaves. The bracts are less conspicuous and the capsules are smooth and borne on stalks much longer than those of *S. cordata*. The designation "Diamond" alludes to the rhombic enlargement of leaf-scars on older branches noticeable in many cases.

10. Salix cordàta Muhl.

Heart-Leaf Willow

A shrub, 5 to 12 feet in height, with brown or dark and smooth or more or less pubescent twigs; leaves 1½ to 3 inches in length, oblong, lanceolate or oblanceolate, varying from acute to cordate at the base, the apex usually extended into a sharp point, smooth, green above but pale beneath, the margin finely serrate or almost entire, petioles usually short, though sometimes ½ inch or more in length; stipules on vigorous shoots large, round, glandular serrate, and persistent; catkins appearing before the leaves, with a few small leaves at the base, the staminate about an inch long, the pistillate becoming 1½ to 2½ inches in fruit, scales dark brown, the axis hairy; stamens 2 in each flower, the pistil with short stipe, slender style, and short stigmatic lobes; the fruit ripens as a medium brown, smooth, blunt, ovoid capsule.

The Heart-Leaf Willow is transcontinental in its range, extending from New Brunswick to British Columbia and south to Virginia, Missouri, Colorado, and California. It is one of the species most widely diffused through the northern United States and Canada and occurs in moist woods and along streams up to 5,000 feet elevation. In Montana it is found in many places, including Sun River and the valleys about Missoula; in the Dominion, at Banff, at Hector, and at Wapta Lake.

The description above applies to the original form of the species as generally known. From this, however, numerous variations have been observed, which by some authors have been regarded as varieties, by others have been given specific rank. *Salix cordata* is extremely variable, and numerous transitional stages appear to the more rare and extreme types, which have furnished the basis for several specific descriptions. Thus *S. balsamifera* (Hook.) Barratt, *S. Watsoni* (Bebb) Rydb., *S. lutea* Nutt., and *S. angustata* seem to be uncertain variations of *S. cordata* based largely on prevailing types of leaf form, but with few if any dependable differences. The descriptions of these species as given in the literature are approximately covered by that of *Salix cordata* and are almost mutually interchangeable. For example, no definite dependable difference has yet been pointed out between *S. balsamifera* and *S. cordata; S. Watsoni* is usually cited as a shrub or small tree usually larger than allowed for *S. cordata,* and with smaller and less acuminate leaves; *S. angustata* has narrow leaves, and *S. lutea* a yellowish-green tinge of leaves and twigs. Although satisfactory grounds for distinction between these forms may ultimately establish them beyond question as valid species, for the present they will be regarded as variations of *S. cordata.*

11. Salix myrtilloìdes L.

Bog Willow

An erect shrub, several feet in height, with brown glabrous twigs; leaves up to 2 inches in length and ½ inch wide, oblong, obovate, or oblanceolate, usually obtuse at the apex, narrowing toward the base, entire, the margins often slightly rolled, green above, pale beneath, or glaucous, short-petioled; catkins appearing with the leaves, leafy bracted at the base and rather dense, 1 inch or less long in flower, longer in fruit, with persistent, obtuse, and slightly villous scales; each staminate flower bears 2 stamens; in the pistillate flower the style is shorter than or equaling the stigmas; the capsule is oblong conic, obtuse, smooth, dark-colored, less than ¼ inch long, much longer than the filiform stalk, which slightly exceeds the scale.

The Bog Willow is circumpolar in its distribution, but in North America is better known on the eastern than on the western side of the continent. It is especially northern in its distribution and is found in bogs from New Brunswick and Quebec to British Columbia and south to New Jersey, Iowa, and Washington, and in the Rocky Mountains probably to Montana. In the Canadian Rockies a specific locality may be mentioned at Bow River.

The American members of this species are sometimes described under the name, *S. pedicellaris* Pursh, but the majority of opinion includes the New and Old World forms under the designation *S. myrtilloides,* founded by Linnaeus in 1753.

12. **Salix pseudomyrsinites** Anderss.

False Myrtle Willow

A shrub, 3 to 9 feet high, with short, slender, dark brown, lustrous, and widely branching twigs; leaves 1 to 3 inches long, ⅓ to ¾ inch wide, elliptic, oblanceolate to lanceolate-oblong, acute to acuminate at the apex, mostly rounded at the base, margins slightly glandular serrate or nearly entire, dark green above, slightly paler and coarsely net-veined beneath, petioles short, smooth or slightly hairy; stipules large, lanceolate to ovate, acute, glandular serrate; catkins on short, somewhat bracted peduncles, small, about an inch long, hairy, scales oblong or oblanceolate, acute or truncate, thinly hairy; capsules green, less than ¼ inch long; stigmas thick, short.

This species is found in middle to high altitudes from Saskatchewan to New Mexico and west to eastern Oregon and Washington; in Yellowstone Park, and in Montana in Park County and Prickly Pear Canyon; in the Canadian Rockies, at Bow River and Banff.

The False Myrtle Willow is sometimes regarded as the Rocky Mountain form of *Salix novae-angliae* Anderss., which is transcontinental northward, occurring in mountain bogs from Labrador and Quebec to Alaska and south to Wyoming and Oregon. The New England Willow is described as a low-spreading shrub with obovate-oblong or oblanceolate leaves, which are 1 to 2 inches long, ½ to 1 inch wide, smooth, green, closely crenate, shining and prominently nerved at maturity; stipules small or none; catkins terminal on leafy twigs, oblong in form, 1 to 1½ inches long; scales dark, covered with long hairs; capsule conic-beaked, stalked, stigmas thick, entire, erect.[1]

13. **Salix lasiolèpis** Benth.

White Willow

A tree, 20 to 30, or in exceptional cases even 50 feet high, with erect branches and open crown; the twigs may change from densely pubescent to smooth, and from bright reddish-brown to darker; the bark on younger stems thin, smooth, light gray, becoming darker with age, about ⅛ inch thick and broken by furrows into broad, flat, irregular ridges; leaves 2 to 3 inches long, usually oblanceolate, varying to oblong lanceolate, sometimes sickle-shaped, blunt or rounded at the apex, narrowed at the base, entire or with minute teeth on the margins, hairy on both sides when young, especially beneath, but usually becoming smooth with age, sometimes rusty colored on the veins and surfaces beneath, dark green above, rather conspicuously netted-veined below, petioles ¼ to ½ inch long; stipules ovate, small, pubescent, deciduous or persistent; catkins on leafless lateral shoots, cylindrical, 1½ to 3 inches long, the most conspicuous feature being the densely woolly scales from among which the stamens and pistils protrude; each staminate flower bears 2 stamens, the filaments often united at the base; pistil slender, smooth, with short style, topped by short stigmatic lobes; fruit smooth, narrowly ovoid, nearly sessile.

The White Willow is found from Washington to Lower California and probably reaches the Rocky Mountains in Idaho, Montana, and Utah. It was first brought to notice by Bentham through material collected by Theodor Hartweg on the banks of streams near Salinas and Carmel, California.

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[1] The Blueberry Willow (*S. myrtillifolia* Anderss.) is known in some places in the Canadian Rockies as a small trailing, or nearly prostrate willow, the branches sometimes rising to a height of a foot or more above the ground; leaves usually less than 1 inch long, obovate, oblanceolate or oval, broadly acute or obtuse at base and apex, sometimes rounded, crenate about the whole margin, entirely smooth; catkins appear with the leaves from lateral buds on old wood, the short pubescent stems bearing a few small leaves, the pistillate less than 1 inch long and less than ¼ inch in diameter, scales short, black-tipped and sparingly hairy; capsule smooth, lanceolate, tapering into a short style; pedicel a little shorter than the catkin scale.

The original collection of this plant was from low places on the east side of the Rocky Mountains in British America, but it has since been found from Alaska to Alberta, and may possibly be found in Montana.

14. **Salix montìcola** Bebb

Mountain Willow

A shrub, densely branched, 8 to 12 feet high; buds large, ovate, beaked at tip; leaves 3 to 6 inches long, 1 to 1¾ inches wide, oblong-lanceolate, the earliest obovate, acute, evenly crenate or serrulate, smooth or weakly hairs above, glaucous beneath, rigid, or pale beneath and thin; stipules large, semi-cordate, acute; catkins thick, dense, sessile; staminate closely so, pistillate with a few broad bracts at the base, the latter when in flower about 1 inch long, in fruit 1½ to 2 inches long; scales oval, obtuse, clothed with long, white, silky hairs; capsules ovate, conical, glabrous, sessile or nearly so, style elongated, stigmas erect, bifid or entire.

The Mountain Willow is now known to occur in the Rocky Mountains from Alberta to Colorado, growing usually in marshy places along streams, at altitudes of from 6,000 to 10,000 feet. In Montana it has been collected at Cliff Lake, and in Highwood Canyon and Emigrant Gulch; in the Canadian Rockies, at Banff, Laggan, and Asulkan Creek.

Some authors consider *Salix padophylla* Rydb. as equivalent to this species. Without deciding this point, we may describe it as a shrub 3 to 20 feet high, with light brown, smooth bark and straight, upright twigs, which when young are smooth, shining yellow or purple brown; leaves 1½ to 2 inches long, ⅛ to ½ inch wide, oval or broad elliptic, acute or nearly obtuse, rounded at the base, crenate, when young sparingly covered with silky hairs, but soon smooth, dark green above, paler beneath; pistillate catkins 1 to 2 inches long, dense, appearing usually before the leaves, borne on very short branches and subtended by 1 to 4 small leaves, scales obovate, brown, bearing white wool on the back; pistils nearly sessile, smooth, style short, 2-cleft; capsule ovate-conic, ¼ inch long; staminate catkin sessile, 1 inch long, ½ inch in diameter, bracts as in the pistillate; stamens 2, with smooth filaments.

This species, if such it is, is known from the Rocky Mountains of Montana, Wyoming, and Colorado. Apparently related very closely to *S. mackenziana,* it has been referred usually to *S. cordata.* In Montana it has been collected near Monida.

15. **Salix curtiflòra** Anderss.

A tall shrub with yellowish or purplish, usually straight and slender twigs; leaves 1 to 1½ inches in length, narrowly oblong, or elliptical or oblanceolate, acute or short acuminate at the apex, rounded or even cordate at the base, finely serrate, green and shining above, glaucous beneath, on short petioles, flanked by small stipules; catkins about an inch or less in length, naked or with a few small leaves at the base; scales black, long-woolly on the inner surface; pistil with a short stipe and distinct style; fruit smooth, beaked.

This species is found from Saskatchewan to Alberta and Colorado. Andersson described this and *S. pseudomyrsinites* and *S. myrtillifolia* but later put them together as varieties of *S. novae-angliae.* Most American botanists, however, consider them distinct.

16. **Salix Bàrclayi** Anderss.

Barclay's Willow

A shrub of wide-spreading form, 4 to 5 feet in height, the branches covered with a brown bark, except the youngest twigs, which are grayish pubescent; buds near the ends of the twigs are plump, oval, smooth, and less than ¼ inch in length, those farther back are smaller, flattened against the stem, and conform to the reddish-brown color of the bark; leaves ¾ to 1½ inches long, ¼ to ½ inch wide, elliptic or obovate with both apex and base acute, margin serrulate, nearly or quite smooth above and below, the reticulate venation quite evident on the lower side, almost sessile; stipules small and early deciduous; catkins on the ends of short leafy twigs, in flower usually less than an inch in length, the scales dark, ovate, persistent, and coated with long silky hairs; pistillate catkins in fruit may reach 1½ inches in length; capsules crowded, short conic and glabrous.

The range of Barclay's Willow is from the arctic regions of Alaska and British Columbia south to Oregon, Idaho, Montana, and Wyoming. In Montana it has been collected in the southwestern part on Trail Creek, and in Glacier Park near Grinnell Peak; also in Yellowstone Park; in the Dominion, at Glacier, at Banff, at Hector, and at Rogers Pass. It is also the most common bush willow of the Alaskan coast. It often forms dense, shrubby thickets over considerable areas in open bogs.

The leaves of *Salix Barclayi* are more than usually variable, as the willows go. In the common form as described above, they appear upon slow-growing twigs, but on more vigorous shoots of the same plant the leaves are often much larger, woolly with matted pubescence on both sides, the margin hardly visibly serrulate and the bases of the petioles flanked by prominent stipules, ovate in form, glandular-margined and deciduous.

17. **Salix commutàta** Bebb

Greenbacked Willow

A shrub, the youngest twigs of which are covered with a soft, grayish pubescence, which gradually gives way in the second year to the reddish-brown cork layer which covers the rounded branches, and which in turn may give way to a smooth greenish bark on the older stems; leaves on vigorous sterile shoots may be 4 inches or more in length, diminishing to an inch or two on less rapidly growing stems; from oblong outlines they vary to oval or oblanceolate, usually abruptly pointed or cuspidate at the apex, acute or rounded at the base, minutely glandular-serrate, covered with a dense coat of silky hairs until fully grown, but with age sometimes becoming nearly smooth and green on both sides, distinctly petioled; stipules large, rounded in form and margined like the leaves; catkins terminal on short, leafy shoots, densely flowered, an inch or more in length, scales light or dark brown, obtuse and woolly; catkins in fruit about 2 inches long; capsules ovate-conical, smooth, brown.

The range of *Salix commutata* is from Alaska to Oregon and Idaho. It occurs in cold or alpine bogs or other situations throughout the high mountains; in the Canadian Rockies, at Laughing Falls, Emerald Lake, and the summit of the Selkirks.

While most species of willows at the lower altitudes flower in April or early May, this species, as well as others of the higher altitudes, seldom blooms before July 15, and often not until well into August.

This willow grows from 2 to 10 feet in height and much resembles *S. Barclayi,* from which it differs by the absence of the glaucous covering of the leaves and the presence of a denticulate instead of a glandular serrate margin, such as usually obtains in the latter case. Where exposed to the rigors of alpine conditions *S. commutata* may be a low, straggling shrub, but in more sheltered situations it assumes a taller and more erect form.

Salix commutata was described by Bebb in 1888 from material collected in alpine bogs of the Eagle Creek Mountains near the Snake River. The author says: "In its glabrous rufescent capsules, entire style, and short erect stigmas, and its large serrulate stipules this species obviously resembles *S. cordata;* while, on the other hand, the whole habit of the plant, the broad softly tomentose and entire leaves, the stout leafy peduncles and subsessile capsules are like *S. glauca.*" In the opinion of Mr. Bebb this species and its fellows represents a transitional group between those centered about *S. cordata* on the north and those on the south related to *S. glauca.*

18. **Salix Wólfii** Bebb

Wolf's Willow

A low shrub less than 3 feet high; leaves oblanceolate, or the lower narrowly oblong, acute, entire, silky when young, with a tendency to blacken in drying, at length smooth, rigid, and green on both sides; stipules none; catkins small, subglobose (less than ½ inch long), densely flowered, scarcely peduncled, with 3 or 4 bracts at the base, which exceed in length the mature fertile catkin; scales obtuse, black, very sparingly hairy; pistils with short pedicels, slender greenish or dull style and small, bifid or entire stigmas; capsule conical, ovate at the base, pointed, glabrous, greenish or dull red.

Wolf's Willow is a plant of the alpine bogs of from 6,000 to 9,000 feet altitude in Colorado, Wyoming, Idaho, and Yellowstone Park, and probably in Montana. It was discovered on one of Wheeler's expeditions to the Rocky Mountains (1873–1875) and probably named in honor of John Wolf, a botanical collector with the exploring party in 1873. It was described by Bebb in 1878.

19. **Salix Tweèdyi** (Bebb) Ball

Tweedy's Willow

A shrub with short, stout, spreading branches; bark on older stems gray, on younger ones chestnut-brown to deep reddish-brown, usually smooth except on the twigs of the season, which usually are densely covered with spreading gray hairs; buds ¼ to ⅝ inch long, chestnut, with a few long hairs but at last smooth; leaves 2 to 3 inches long, 1 to 1½ inches wide, elliptical and acute at both ends, or broader and obtuse at the apex and rounded at the base when mature, sometimes rounded at the apex when young, margin finely and closely denticulate or serrate with yellowish glands projecting at right angles to the apparently entire margins of the young leaves, smooth on both sides, or the young sparsely covered above with long gray hairs, green above, paler but not glaucous beneath; petioles ⅓ to ½ inch long, often hairy; stipules large, reniform, clasping, glandular-toothed; catkins emerging before the leaves, sessile, 1½ to 2½ inches long, ½ to ¾ inch wide in fruit, scale obovate, acute or obtuse, black, hairy; capsule green, glabrous, or finely pubescent near the apex, ovate conical.

Tweedy's Willow is found in the high mountains of Montana, Idaho, and Wyoming. It is comparatively rare and has not often been collected; it is known only from southeastern Idaho, southern Montana, and Wyoming, the type locality being in the Bighorn Mountains.

Much of the material from the region indicated is known in the collections and the literature as *Salix Tweedyi* or more often as *S. Barrattiana* var. *Tweedyi.* In stature and appearance it has much the appearance of *S. Barclayi,* but as far as observed seems to differ from that species in its smoother leaves and larger fruiting catkins (2½ to 3 inches long by ½ to ¾ inch wide) and by the production of catkins of both kinds on short, leafless, or at the most bracted stems.

20. **Salix Dodgeàna** Rydb.

Dodge's Willow

A diminutive shrub, rising hardly an inch above the ground; slender stems mostly subterranean; shoots, at least when young, with yellowish-green bark, changing with age to brown; shoots densely leafy, the whole plant glabrous except the margins of the scales; leaves ¼ inch long, oblong or oval, obtuse or nearly acute, light green, strongly veined; staminate catkins 3- to 4-flowered, stamens 2 with slender glabrous filaments more than twice as long as the scales, anthers short; pistillate catkins generally 2-flowered, scales oblong, square across the outer end, sparingly hairy; capsule oblong, ovoid, glabrous, with 2 sessile, 2-cleft stigmas.

This willow is known only from the high mountain peaks of Montana and Wyoming. It was originally discovered by Rydberg on Electric Peak in Yellowstone Park, where it covered acres of ground. In Wyoming it is reported from the summit of Sheep Mountain in the Teton Forest. Probably the smallest of all willows.

21. **Salix Geyeriàna** Anderss.

Geyer's Willow

A shrub 10 to 15 feet in height, twigs and small, ovate buds at first covered with a bluish bloom, which later disappears, revealing a smooth, brown, lustrous bark; twigs zigzag, spreading, roughened by prominent leaf-scars; leaves 2 to 3 inches long, ⅛ to ½ inch wide, linear, lanceolate or oblanceolate, acute at both ends, entire, silky, appressed hairy when young, especially beneath, nearly smooth above at maturity, hairy or pale beneath; stipules none; catkins at first small, nearly globose, scarcely longer than the 3 or 4 bracts at the base, becoming short-stalked in fruit, scales brown, obtuse, sparingly hairy; capsule tapering from an ovate base, silky-hairy, pedicels slender, minutely hairy, half as long as the ovary, stigmas sessile, bifid.

This willow is one of the species of the northwest with a range from British Columbia to California, Montana, and Colorado, and finds a suitable habitat along creek banks in mountain valleys. It is found on the Flathead River, and the Lolo and other streams of western Montana.

By some this species is regarded as the same as *S. macrocarpa* Nutt.

22. **Salix Bebbiàna** Sarg.

Bebb's Willow. Fig. 12

Usually a shrub from 10 to 15 feet in height, this may under favorable conditions reach the stature of 25 feet as a small tree; the

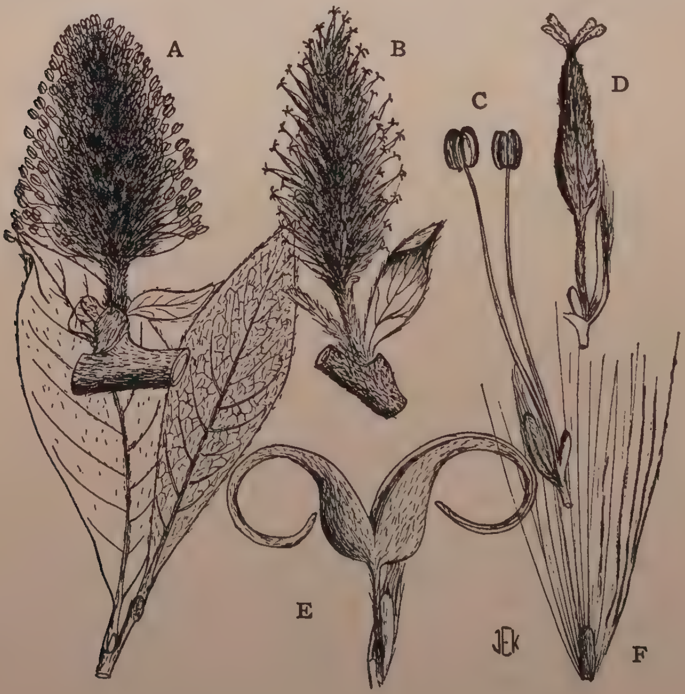

Fig. 12.—*Salix Bebbiana* Sarg. Bebb's Willow

Leaves ×1½; *A* and *B*, male and female flower clusters respectively, ×3; *C* and *D*, male and female flowers respectively, ×9; *E* and *F*, opened capsule and seed, ×9.

twigs are covered with a green bark, shading into a dark brown, rough, with prominent leaf-scars, and branching at wide angles; winter buds small, appressed to the twig; leaves usually 1 to 2 inches long, varying from elliptic to lanceolate, oblanceolate or obovate, from acute to rounded at base and apex, the margin usually entire and the surface covered on both sides with appressed hairs when young but becoming nearly or quite smooth with age; petioles short; stipules minute, deciduous; catkins sessile or nearly so, naked or accompanied by a few small leaves, the staminate ½ to ¾ inch long, the pistillate an inch or more, scales brown, usually persistent and clothed with long hairs; 2 stamens in each staminate flower; pistil slender, hairy, borne on a stipe about ⅛ inch long, style very short; in fruit the catkin may become 2 inches or more in length; capsule less hairy than in flower, its two valves strongly curled backward from the apex.

Bebb's Willow is found from Anticosti to Alaska and south on the Atlantic Coast to Pennsylvania, in the Rocky Mountains to New Mexico and Arizona, and on the Pacific Coast to Oregon. This is one of the most common of the Rocky Mountain willows. Its first discovery dates from Sir John Franklin's first expedition to the interior of British America.

23. **Salix petiolàris** J. E. Smith

Slender Willow

A shrub 5 to 12 feet high with slender purplish twigs; leaves 1½ to 3 inches long, ½ to ⅝ inch wide, lanceolate, tapering at both ends, serrulate with thick, blunt teeth, slightly silky, dark green, shining above, or somewhat pubescent, glaucous beneath; catkins appearing before the leaves, the pistillate short-stalked, naked or with a few bracts at the base, rather loose, about 1 inch long; scales yellow, sometimes with dark tips, white-hairy; stamens 2, with smooth filaments; pistils with nearly sessile stigmas; capsule ovoid at the base, long-tapering, ¼ inch or less long, about twice as long as the pedicel, hairy.

The range of this species is from New Brunswick to Tennessee and west to Saskatchewan, Alberta, South Dakota, and probably Montana. It was described by Smith in 1802.

24. **Salix díscolor** Muhl.

Pussy Willow

A shrub sometimes reaching 15 feet in height, with thin, reddish-brown bark, changing to deep brown or purplish on the twigs, which are often long, straight, and slender; buds plump, flattened on side toward the stem, ¼ to ⅜ inch long, russet brown or darker; leaves 3 to 5 inches long, ¾ to 1½ inches wide, oblong, varying to obovate or oblanceolate, taper-pointed at the apex, acute or rounded at the base, margin shallowly crenulate-serrate to dentate, mostly smooth at maturity, dark green above, glaucous and reticulate beneath, with yellowish midribs and slender, curved primary veins; petioles slender; stipules leaf-like, semilunar, acute, glandular-dentate, about ¼ inch long, deciduous early; catkins appearing very early in the spring, densely coated with soft, white hairs, sessile, or with very short stalks on short, bracted twigs, oblong, cylindrical, 1 inch long, ⅝ inch thick, the staminate densely flowered, scales oblong to obovate, dark reddish-brown toward the apex, covered on the back with long, silky-silvery white hairs; stamens with elongated glabrous filaments; pistil long-stalked, with narrowly lanceolate ovary, short distinct style and spreading stigmas; capsule narrow, swollen at the base, light brown, ¼ inch or more long, hairy.

This species is found from Nova Scotia to Delaware and west to the Rocky Mountains. It is a very common willow in the eastern part of its range, appearing sparingly in the plains and the Black Hills and again not uncommon along streams and elsewhere at moderate elevations in the Rocky Mountains. It occupies swamps, stream banks, and moist uplands.

25. **Salix Scoulerìana** Barratt

Scouler's Willow

An erect and vigorous shrub reaching a height of 20 feet or more, sometimes a tree of medium size, with thin, smooth, ashy-brown bark; twigs of the last season as a rule densely pubescent, varying to smooth, becoming consistently smooth and dark brown in the second year; fertile winter buds ¼ to ⅜ inch long, plump, oval, pointed, reddish-brown, hairy about the base or sometimes entirely covered with a short and dense pubescence; leaves 2 to 4 inches long, ¾ to 1½ inches wide, oblanceolate or obovate, rounded or blunt-pointed at the apex, wedge-shaped at the base, entire or obscurely crenate, both sides silky pubescent when young, but at maturity the upper surface smooth and dark green, the lower varying from densely short-hairy to pale and glaucous; petioles ⅛ to ¼ inch long; stipules ⅛ to ¼ inch long, semilunar, toothed, persistent; catkins appear with or before the leaves, usually naked or with a few small bract-like leaves at the base, at first densely pubescent with long silky hairs, the staminate 1 inch long, ⅜ inch thick, pistillate somewhat longer, scales dark, blunt at the apex, covered with long hairs, persistent under the fruit; staminate flowers bearing 2 stamens with glabrous filaments; pistil stalked, cylindrical or narrowly conical ovary, style short and large stigmas notched or divided into narrow lobes; capsule covered with short dense hairs, ¼ to ⅜ inch long, swollen at the base and tapering slightly to a blunt point, valves closely rolled backward from the apex.

Scouler's Willow is one of the more common species from Alaska through the Rocky Mountains to New Mexico and Arizona and west to the coast. In Montana it has been collected in Emigrant Gulch, Sand Coulee, Glacier Park, the Bitterroot Mountains, and many other places; in the Canadian Rockies, at Donald on the Columbia. It occurs at altitudes up to 6,000 feet in Montana, and grows in various situations, along streams, on open slopes and burns and pastures.

This species was first discovered by Dr. Scouler on the Columbia River, and was described by Barratt in 1840. It was later collected by Nuttall in the Rocky Mountains in Wyoming near the old overland route now followed by the Union Pacific Railway and described in his *Sylva* in 1842 under the name *S. flavescens.* It is also known as *S. Nuttallii* Sarg.

26. **Salix Lémmoni** Bebb

Lemmon's Willow

A shrub, 5 to 13 feet high; leaves 1 to 1½ inches long, ¼ inch wide, lanceolate, tapered at both ends, entire, green, nearly alike on both faces, glabrous or nearly so, dark-veined; petioles less than ¼ inch long; stipules small, soon deciduous; catkins ½ inch long, on very short peduncles, with 2 or 3 foliaceous bracts, or none, scales black, usually rounded, hairy; each staminate flower bears 2 stamens with filaments slightly puberulent at the base; pistil with hairy ovary, short style, short, linear, and entire stigmas; capsule grayish-hairy or later smooth, on short pedicels.

Lemmon's Willow is found along streams from Oregon to California and Nevada and eastward to the Rocky Mountains in Utah and Idaho. In the southern part of its range it ascends to from 7,000 to 8,000 feet.

It was collected originally in Sierra County, California, by J. G. Lemmon, a pioneer California botanist, and described by Bebb in Watson's *Botany of California* in 1880.

27. **Salix alaxénsis** Cov.

Felt-Leaf Willow

This species, though usually a shrub, sometimes assumes tree form and reaches a height of 30 feet and a stem diameter of 5 to 6 inches; twigs, at first densely covered with yellowish-white hairs, become gradually smoother, exposing a dark brown or purple bark; leaves 2 inches more or less in length, varying from elliptical to ovate, sometimes lanceolate, sharp-pointed at the apex, but scarcely tapering, the base from wedge-shaped to rounded, margin entire at maturity, obscurely toothed when young, slightly hairy above along the principal veins, but white beneath with densely felted pubescence; petioles short, hairy, flat or channeled above, and flanked by narrow, pointed stipules ⅛ to ¼ inch in length; catkins appearing after the leaves, stout, erect, hairy, nearly sessile, scales ovate, blunt-pointed; staminate flowers bear 2 stamens each; the pistillate bear a narrow conical ovary on a short stalk and terminated above by a slender style and 2-lobed stigma; capsule yellow, less than ¼ inch long, densely wooly and borne on a compact catkin.

The Felt-Leaf Willow has long been known along the Asiatic and American shores of Bering Sea and eastward as far as the Mackenzie River. Like many other plants of the Northwest it has extended its range eastward into the Rocky Mountains. It was reported by Richardson from Fort Franklin on the Mackenzie River, and by Drummond on the high peaks of the Rocky Mountains.

This plant was first brought to notice through the collections of Captain Beechy on the cruise of the "Blossom" to Bering Straits in 1825–1828. Hooker and Arnott, who wrote the botany of the voyage, described it under the name *S. speciosa.* As they had only sterile branches its structural features were not fully known until the publication of Hooker's *Flora* in 1839. In its vegetative condition, however, it is so distinctive, owing to the heavily felted coating of white wool covering twigs, leaves, and catkins, that it can easily be separated from other species. *Salix longistylis* Rydb. is regarded as the same species. It has been known as *S. alaxensis* since 1901, when it was described by Coville in the papers of the Harriman Alaska Expedition.

28. **Salix Barrattiàna** Hook.

Barratt's Willow

A shrub with tortuous, stout, nearly glabrous branches, clothed with dark-brown bark, marked by numerous leaf-scars; leaves 2 to 3 inches long, blunt at the apex, cordate at the base, margins finely glandular-serrate, covered with an ample silky pubescence; stipules small; catkins very silky, the staminate 2 inches long, the pistillate sometimes reaching as much as 4 inches, sessile, naked, the scales dark; capsule silky-hairy, about ¼ inch long.

This willow is found in the high mountains from northern British Columbia and Alberta south into Montana and Wyoming. It occurs in alpine swamps as a low straggling shrub.

Salix Barrattiana was described by Hooker in 1839 from "alpine swamps of the Rocky Mountains" and named for Dr. Barratt, an eminent student of the willows of North America; since reported from Lake Louise and Yoho Valley near Laughing Falls.

This appears to be a rare species, and some of the herbarium material so labeled seems to be a closely related form which sometimes goes under the varietal or specific name of *Tweedyi,* which in some of its forms also closely resembles *S. Barclayi,* as stated above. While *S. Barrattiana* is described as beautifully silky-pubescent, especially on the catkins, *S. Tweedyi* is said to be sparingly silky-pubescent when young, the leaves later becoming smooth and green on both sides and the capsules likewise. Hooker's descriptions and illustrations of *S. Barrattiana* are very clear, but the rarity of the species and its meager representation in the collections and literature render the distinctions uncertain.

29. **Salix cándida** Fluegge

Hoary Willow

A shrub varying from 2 to 5 feet in height; twigs of 1 to 3 years vary from bright red to green, those of the present season usually covered with a dense, white, matted pubescence; leaves up to 3 inches in length, ⅝ of an inch in width, usually oblong, acute at both ends but also lanceolate, oblanceolate, or spatulate, margin entire or with minute teeth or faint undulations and often rolled toward the lower side, thick in texture, marked on the upper side by depressed pubescent veins, covered beneath by dense white pubescence; petioles short; stipules minute, leaf-like, gland-bearing, but early deciduous; catkins in flower are usually less than an inch in length, compact, bearing a few bract-like leaves at the base, scales broadly ovate, blunt, pale brown and covered with long silvery hairs; stamens 2, moderately exserted, yellow; fruiting catkins attain a length of 2 inches more or less; the styles and stigmas dark purple; capsule broadly conical, ¼ inch or less long, matted-pubescent on the surface and opening by 2 strongly recurved valves.

The Hoary Willow is found from Labrador to the Rocky Mountains and south to New Jersey, Colorado, and Idaho. In Montana it is reported from Cutbank and from Pack River; and from the Canadian Rockies, where it is described as a beautiful species throughout the wooded country; it is reported from Banff and Vermilion Lakes.

It occurs especially in bogs and along streams at ordinary elevations. Its most striking characteristic is the foliage with the silvery white of the lower in contrast with the upper surfaces of the leaves.

30. **Salix béllа** Piper

Beautiful Willow

A shrub, 6 to 12 feet high with slender, erect stems and smooth gray bark; branches erect or slightly spreading; twigs shining, yellow, very brittle, smooth or sometimes finely pubescent, tending to glaucous; leaves 1 to 2½ inches long, or on vigorous young shoots 4 to 5 inches long, about one-fourth as wide, lanceolate or oblong or oblong-obovate, mostly acute, entire or obscurely crenulate, bearing minute, appressed hairs above, velvety with a persistent coat of matted silvery hairs beneath, midrib yellow, conspicuous, bearing about 15 pairs of primary veins; stipules usually present, free, lunate, acute, ¼ inch long or less; catkins sessile, preceding the leaves, or the pistillate on short stems that bear a few small leaves; staminate catkins about ½ inch long, densely flowered, scales black, ovate, usually acute, persistent, densely covered with long tawny hairs; stamens 2, usually unequal, twice as long as the scale, filaments free, anthers yellow; pistillate catkin stout, oblong, about 1 inch long, or in fruit 1½ to 2½ inches, densely flowered, scales black, persistent, oblong, obtuse, covered with white hairs twice as long; pistil on short stalk, with short style, stigmas thick, broad, entire or 2-lobed; capsule narrowly and somewhat angularly pyriform, tapering, acute, grayish pubescent, about ¼ inch long.

Salix bella seems to be distributed mainly in the inland basin region, at elevations of from 3,000 to 5,000 feet, along the streams of eastern Oregon, Washington, and adjacent Idaho, but it has reached the western slope of the Rocky Mountains, since it has been reported from Glacier National Park, and also from Alberta, near Banff. It was first discovered by L. F. Henderson near Garrison, Whitman County, Washington, and described by Piper in 1900. It is most nearly related to *Salix candida*.

31. **Salix sitchénsis** Sanson

Sitka Willow

A shrub, or sometimes a tree 30 feet in height and with a stem diameter of 6 to 12 inches; bark on old stems somewhat scaly, on younger thin and brown; young twigs usually densely hairy though sometimes nearly smooth, dark reddish-brown to orange color, sometimes glaucous in their second season; winter buds small, ¼ inch long, round or somewhat flattened, pubescent or nearly smooth; leaves 1½ to 5 inches long, ⅜ to 2 inches wide, oblanceolate or obovate, blunt-pointed or rounded at the apex, tapering toward the base, margin entire or with very remote and minute glandular teeth, hairy on both sides when very young, when mature slightly hairy above and lustrous beneath with persistent and densely matted silvery hairs; petioles less than ½ inch long, hairy; stipules broad, leafy, glandular-toothed, deciduous; catkins cylindrical; staminate 1 to 2 inches long, ½ inch broad, the flowers with a single stamen with smooth filament; pistillate catkins 2 to 3 inches long, ¼ inch broad, the flowers bearing a pistil with short stalk, hairy, ovoid ovary, slender style, and short, thick stigmas; scales of both catkins pale brown, hairy, those of the staminate rounded at the apex and longer than those of the pistillate flower, which are broad and acute; fruiting catkins may reach 3 inches in length; capsule ovoid, less than ¼ inch long, grayish with dense, short hairs.

This willow is found from Alaska to California and east to the Rocky Mountains of Montana, where it occurs at elevations of 3,500 feet or more. It is exceedingly variable in appearance, assuming under the more rigorous conditions of high altitudes or far northern latitudes a low prostrate form; elsewhere appearing as a tall, vigorous shrub, or in the most favored localities as a tree. It occurs in the Canadian Rockies at Laggan and at Rogers Pass.

32. **Salix Drummondiàna** Barratt

Drummond's Willow

A shrub, with elongated, rather closely ascending branches and smooth twigs; leaves about 2 inches long, 1 inch, more or less, wide above the middle, obovate-oblong, entire or at the apex obscurely serrate, the edges slightly rolled back, smooth above and very slightly wrinkled, white beneath with dense matted hairs, the midrib yellowish-brown, nearly smooth; stipules white beneath, like the leaves, ovate, almost as long as the petiole, persistent; catkins cylindrical, erect, compact, an inch or more long in the flowering state, twice as long in fruit, scales ovate, lanceolate, pubescent; pistillate flowers spreading, crowded, ovary ovate, acuminate, densely pubescent, style short, stigma lobes slightly bifid or entire.

This willow occurs in the marshes and prairies of the Canadian Rockies and on the summits of the Selkirk Mountains. It was described by Barratt in 1839.

33. **Salix argyrocàrpa** Anderss.

Silver-fruited Willow

An erect shrub 1 to 2 feet high; leaves 1 to 2 inches long, ¼ to ½ inch wide, oblong or oblanceolate, acute at both ends, entire or crenulate, bright green and smooth above, silvery-silky beneath; catkins on short, leafy branches, dense, up to 1 inch long, scales hairy; capsule ⅛ inch or less long, white-hairy, on short stalk.

It is found on mountains and foothills from Labrador to New Hampshire and Mackenzie.

34. **Salix arbusculoìdes** Anderss.

Little Tree Willow

An erect shrub less than 3 feet high; leaves 1 to 2 inches long, lanceolate-elliptic, or sometimes slightly oblanceolate, acute at both ends, slightly serrate or entire, entirely smooth and green above, the lower with a permanent covering of closely appressed short hairs; catkins loosely flowered, appearing with the leaves on short, usually leafy-bracted stems, 1 inch more or less in length, cylindrical and slender, scales light to dark brown, sparingly hairy; stamens 2 in each flower; capsule about ⅛ inch long, nearly sessile.

This species is widely distributed northward, occurring from Hudson Bay to the Canadian Rockies and Alaska. The original collection was made in eastern Canada and described by Andersson in 1867. It is equivalent to *S. humillima* Anderss. of 1868.

35. **Salix péllita** Anderss.

Satiny Willow

A shrub with greenish-red to dark-red shining twigs, when young sometimes covered with a glaucous bloom; leaves numerous, narrowly oblanceolate, 1½ to 2 inches long, ⅛ to ¼ inch wide, acute or taper-pointed or the lower obtuse, the margins entire or faintly crenate and rolled back, surface dull green and thinly hairy above, becoming smooth, densely and persistently silvery with matted hairs beneath; petioles slender, ¼ inch or less in length; stipules only on vigorous shoots, semicordate, less than ¼ inch long; staminate catkin about 1 inch long, ⅛ inch wide, the pistillate about 1¼ inches long, ¼ inch thick, very densely flowered, on short bractless stems, scales hairy, acute, tawny, dark at the apex; style of the pistil elongated, stigmas thick, entire, erect; capsule less than ⅛ inch long, conical, acute, hairy at first but later smooth, on short stalks.

The range of *Salix pellita* is from British Columbia to Saskatchewan and south in the Rocky Mountains to Colorado, along streams.

36. **Salix subcoerùlea** Piper

Bluish Willow

A shrub about 6 feet high; branchlets dark, smooth, with a bloom that easily rubs off; leaves 1 to 2 inches long, ⅜ inch wide, oblong-lanceolate, occasionally oblanceolate, taper-pointed at apex, acute at base, entire or faintly crenulate, green and minutely hairy above, silvery beneath with appressed but scarcely matted hairs; petioles about ⅛ inch long; stipules obsolete; pistillate catkins appearing with the leaves, stalked, usually with one or more small leaves at the base, 1 to 1½ inches long, less than ⅜ inch thick, erect, straight or nodding, scales black, ovate, obtuse, sparsely pilose with hairs about the same length; pistil with short, slender style, stigmas thick, usually 2-lobed; capsules short-stalked, pyriform, ⅛ inch long, silvery-silky.

This willow is found from New Mexico and California north to Montana and Oregon, according to some authors; by others it is understood to extend to British Columbia and Alberta. It was first collected in the Powder River Mountains in eastern Oregon, and was described by Piper in 1900. It usually occurs in wet meadows.

Nelson describes this willow as having leaves nearly 3 inches long and up to 1 inch wide; staminate catkins sessile, less than 1 inch long, stout, stamens 2; scales brown or black, oblong, ovate or obovate, acute or obtuse. It is by some regarded as the same as *S. pellita,* as that species is understood by authors but not as described by Andersson. It is also thought to include as forms *S. Covillea* Eastw. and *S. pachnophora* Rydb.

37. **Salix glaùcops** Anderss.

Gray Willow

A shrub 2 to 5 feet in height with branches and twigs short and stout, shining, chestnut-brown or darker, the bark on older twigs separating in thin gray scales; leaves 1 to 2 inches long, up to ¾ inch wide, elliptic lanceolate or oblanceolate to oblong ovate, obtuse or acute at the apex, obtuse to nearly cordate at the base, margin entire, gray with matted hairs on both sides, or becoming smooth, dark green above, glaucous and netted beneath; petioles yellowish, ¼ inch long; stipules minute, semicordate or ovate; staminate catkins ½ to 1 inch long, ½ inch or less wide, the pistillate 1 to 1½ inches long, same width as the staminate, scales oblong, dark to pale brown, hairy; styles brown or yellowish, short; capsules conic, gray hairy, ¼ inch or more long, on short, stout, hairy pedicels.

The range of this species is from British Columbia through the Rocky Mountains to New Mexico and west to the coast, usually occurring in bogs and wet places. It has been collected in Yellowstone Park and in Montana in Gallatin County and the Little Belt Mountains and on the East Boulder Plateau, from middle to high elevations; in the British Rockies, at Banff, Lake Minnewauka, and moraine of Wapta Glacier in Yoho Valley.

The Gray Willow, so called in allusion to its covering of long gray hairs, is variously understood by various authors: some consider it a hairy variety of *S. glauca,* regarded by them as circumpolar in its distribution; others would restrict *S. glauca* to the Old World and view the species known as *S. glaucops* as its American counterpart. Whichever view is taken, the American form is evidently quite variable, is subject to much dispute among authors, and by different opinions is dissected into varieties and species bearing the names *pseudolapponum, Seemannii, glabrescens,* etc. The species *pseudolapponum* may be only a dwarf alpine form of *S. glaucops,* and is so treated here.

38. **Salix desertòrum** Richards

Desert Willow

A low shrub with twigs at first wooly, later becoming smooth, more or less roughened with leaf-scars; leaves rarely exceeding 2 inches in length, ½ inch in width, usually much smaller, narrowly elliptical in form, acute at both apex and base, the latter tapering more gradually, the margin entire and both surfaces hairy when young but the upper tending to become smooth with age. In some cases, especially in younger plants, the lower surface shows densely wooly with appressed hairs. Stipules are small, ovate deciduous. Leaves nearly sessile. Catkins usually naked, or in case of pistillate with a few bracts at the base, in flower usually less than ¼ inch in length, but the bracts reaching 1 line or more when mature, oblong to rather spatulate, obtuse, brown or yellow; style short, stigmas; branches widely spreading; capsule almost sessile, densely covered with white hairs, *opening by moderately recurved valves.*

The geographical distribution of this willow is from Quebec to the far Northwest and south to Wyoming, Colorado, and Utah in the Rocky Mountains. It grows in Yellowstone Park and in Montana has been found at Cataract Creek and Bad Mountain and in Glacier Park. In the Canadian Rockies it is reported from North Kootenai Pass, the Columbia Valley, Calgary, Field, Banff, Wapta Lake, and Morley. It is usually found at high elevations.

It is sometimes cited as a synonym of *S. brachycarpa* Nutt. and *S. stricta* (Andersson) Rydb. The original collection of the plant known as *brachycarpa* was made by Nuttall in the Rocky Mountains of Utah along the Bear River in 1834. Its range as at present understood is from Colorado north to Alberta and British Columbia. It seems to be connected with the species known as *desertorum* by intergrading forms. It is described as having leaf-blades oblong to oval or oblanceolate, about 1½ inches in length, ⅓ to ½ inch wide, entire, obtuse to acute at the apex, acute to nearly cordate at the base. It may be a form of *S. desertorum* peculiar to the Rocky Mountains.

39. Salix McCalliâna Rowley

McCalla's Willow

A shrub 2 to 6 feet in height; young shoots and leaves minutely hairy, soon becoming smooth throughout; bark on older branches dark brown; buds yellow, rather large, pointed, flattened; leaves up to 3 inches in length, and ¾ inch in width, elliptic-oblanceolate, tapering equally to both ends, finely but distinctly serrate, the serrulations terminating in a characteristic callus, green and smooth on both sides at maturity, midrib and primary veins light-yellowish and in strong contrast to the green of the rest of the leaf, which is obscurely reticulately veiny on both sides; petioles ¼ to ½ inch long, yellowish; stipules none; catkins borne on short, leafy stems, the axis and upper part of the stem hoary with abundant hairs, densely flowered, scales membranous and green, later becoming tawny, with 3 or 4 prominent parallel veins, oblong, more than twice the length of the stalk, rounded at the apex, crisp-hairy on the back; stamens 2 with a few spreading hairs at the base; style and stigmas reddish-brown, the former surmounted by 4 short stigmas; capsule large, prominently beaked, ½ inch long at maturity, clothed with short, spreading, silky hairs, with short stalk, the catkin becoming more open at maturity.

This species is known from the British Rockies in Alberta, was collected in 1899, and described by Rowley in 1907.

It seems to be related to *S. glaucops* but differs in having smooth, serrate leaves. The leaves and buds are like those of *S. lucida.*

40. **Salix saskatchewàna** Seemann

Saskatchewan Willow

A shrub with dark, reddish-brown, smooth and shining twigs; leaves 2 inches or less in length, ¼ to ⅛ inch wide, lanceolate, taper-pointed, narrow toward the base, margin finely toothed or serrate, texture leathery, finely silky-hairy when young, both sides smooth at maturity, dark green, shining above, clear green on the lower side, with brown midrib; catkins appearing with the leaves, erect, stalked, the peduncle subtended by silky-hairy bracts, densely flowered, the staminate narrowly cylindrical, ¾ inch long, ¼ inch wide, the pistillate less than ½ inch long, ¼ inch thick, scales broadly oval, yellowish-brown, sparingly gray-hairy on both sides, with somewhat longer hairs upon the upper border; stamens 2, filaments elongated, smooth, anthers oval, after losing pollen becoming dark; pistil with short style and spreading stigma, both yellowish-brown; glands of both flowers broad and stalked; capsule sessile, short conic, thickly gray silky-pubescent.

This species is known from Saskatchewan and Alberta to the Yukon.

41. **Salix petróphila** Rydb.

Rock Willow

A diminutive shrub, growing in mat-like formations, extending by creeping stems and rising to a height of 2 or 3 inches; twigs crooked, varying with age from green to dark brown, with pale brown, ovate buds formed in the axils of the leaves; leaves somewhat crowded toward the ends of the twigs, usually less than 1 inch in length, oval or elliptical in form, acute or obtuse at the apex, acute at the base, mostly smooth both above and below, at least in age, but marked by conspicuous midrib and primary veins below; petioles short; stipules at maturity none; catkins in flower less than 1 inch in length, compact, usually attended by leaves below, scales dark, nearly orbicular, clothed above with long hairs but nearly smooth beneath; stamens 2 in each staminate flower; capsule sessile, ovate, thickly clothed with straight, forward-projecting hairs. The pistillate catkins sometimes grow in fruit to a length of 2 inches.

The range of the Rock Willow is from the far Northwest through the Rocky Mountains to New Mexico and from British Columbia through the Cascade and the Sierra Nevada Mountains to California. It has been collected in Yellowstone Park and in Montana on Boulder Creek, in the Pony Mountains and in Marias Pass, and on Grinnell Peak in Glacier Park and McDonald Peak in the Mission Range. In the Canadian Rockies it is found in the Selkirks at from 7,500 to 8,000 feet, at Lakes Louise, Agnes, McArthur, Banff, and at Rogers Pass and elsewhere.

It is a plant of the high, barren, and exposed ridges throughout its range, scarcely rising above the stony soil in which its slender roots are fixed.

It seems to be closely related to the arctic willows, *S. arctica* Pall. and *S. anglorum* Cham.

42. **Salix Nelsònii** Ball

Nelson's Willow

A shrub 3 to 10 feet high, freely branching and very leafy; twigs shining, the older gray with reddish tinge, the younger chestnut or darker and often drying dark; buds large, smooth, chestnut-brown, ¼ to ⅜ inch long, beaked; leaves 1¼ to 2¼ inches long, about ½ inch wide, oblanceolate or rarely narrowly lanceolate, acute at both ends, wedge-shaped at the base, entire, except on sterile shoots, where the elliptical apical or sub-apical leaves are shallowly glandular crenate or serrate, the margin somewhat revolute, especially toward the base, smooth, or thinly hairy when young, green and very shining above, pale and somewhat glaucous beneath, primary veins prominent, usually elevated and somewhat greenish-yellow on the upper surface, prominently netted beneath by the elevation of both primaries and secondaries; pistillate catkins sessile, with sometimes a few foliaceous bracts at the base, slender and cylindrical when young, spreading and very much thickened in fruit, ½ to 1¼ inches long, scales dark, ovate, acute, clothed on both sides with long white hairs; styles entire or rarely bifid, stigmas smooth and dark; capsule sessile, ¼ inch long, silky-hairy.

Nelson's Willow is found in the Rocky Mountains from Colorado to Alberta. In Wyoming it has been collected on the Bighorn Mountains and at Laramie Peak; in the Canadian Rockies, at Banff. Its habitat is bogs and river banks.

This species is most closely related to *S. chlorophylla,* which it closely resembles in the character of the pistillate catkins, but from which it differs in the leaves, which at maturity are prominently nerved above.

43. **Salix chlorophýlla** Anderss.

Greenleaf Willow

A shrub about 10 feet in height, with chestnut-brown or purple twigs, sometimes straight but often crooked, smooth, but somewhat knotted at the nodes; buds dark, smooth, beaked, about ¼ inch long; leaves less than 1½ inches long and ½ inch in width, elliptic in outline, wedge-shaped at the apex and base, margins entire, at first covered beneath with silky, appressed hairs, at length nearly or entirely smooth on both sides; catkins emerge from the buds with a few small leaves and vary in length from ½ to 1½ inches, scales black, obtuse and silky-hairy; the pistillate at maturity may be as much as ½ inch in diameter; capsule densely covered with appressed hairs and tipped by the persistent style.

The Greenleaf Willow is transcontinental in its range, extending from Labrador to Alaska, south on the Atlantic Coast, and in the Rockies to New Mexico. In Montana it has been collected in Park and Gallatin counties and the Pony Mountains. It occurs in mountain swamps up to 9,000 feet altitude.

44. **Salix vestìta** Pursh

Rock Willow

A shrub with light brown, smooth twigs and somewhat jointed aspect at the leaf-scars, turning gray with age, branching freely; winter buds reddish-brown, smooth, oval, about ¼ inch in length; leaves 1 to 2 inches long, 1 to 1¼ inches in width, rounded at base and apex, or obtusely pointed at the apex; margin entire or slightly crenate, netted on both sides, smooth above, conspicuously pale with silky hairs beneath; petioles short; stipules none; catkins on leafy, hairy stems, narrow, cylindrical, less than 1 inch long, scales brown, hairy, oblong-ovate; stamens small, slender; pistils very small, sessile, ovate, gray with short, dense hairs, style almost none, stigmas dark, bifid; capsule opening by 2 valves widely spreading.

The range of this species is now known to be from the coasts of Labrador and Newfoundland and about the shores of Hudson Bay to the Rocky Mountains of Alberta and Montana, and on the high summits from British Columbia to Oregon. In Montana it has been collected in Marias Pass, on McDonald Peak in the Mission Mountains, and on Flattop Mountain in Glacier Park; in the Canadian Rockies, in North Kootenai Pass, at Field, Emerald Lake, Hector, and Donald. It is a handsome plant, conspicuous by reason of its rounded oval or orbicular leaves, and grows in spreading masses at altitudes of from 6,000 to 9,000 feet.

This species is known also as *S. Fernaldii* Blank. It was described as *S. vestita* by Pursh in 1814, from material collected in Labrador.

45. **Salix reticulàta** L.

Netleaf Willow

A prostrate shrub, with stems creeping on or below the surface of the ground, forming mats, leafy branches rising to a height of 1 to 3 or 4 inches, twigs reddish-brown, smooth, widely branched; winter buds small, brown, oval; leaves ½ to 1 inch long, ⅜ to 1 inch wide, sometimes varying to obovate but usually oval to nearly orbicular, apex rounded, sometimes obtuse-angled or indented, narrowed at the base or rounded or subcordate, entire, dark green above, pale or glaucous or sometimes hairy beneath, netted on both sides, but especially beneath; catkins terminal, opposite the last leaf on young leafy shoots, the pistillate from ¼ to 1½ inches long, narrow, the staminate shorter, scales broad, rounded or obtuse at the apex, brown or black, slightly hairy on the back, but with short, curled hairs on the inner side; stamens with long filaments, hairy below; pistils short, conic-ovate, sessile, covered with short hairs, style short or none, stigmas short, dark, bifid. Capsule blunt, conic, ⅛ inch long, sometimes becoming less hairy in age.

The Netleaf Willow occurs in arctic and alpine situations around the world in the Northern Hemisphere. It is found in Yellowstone Park, in Montana in the Belt and Pony mountains, and in the Canadian Rockies on Old Man River.

While some authors have attempted to divide the American from the Old World species, the weight of opinion still regards them as the same. The impossibility of reconciling the conflicting views leads one to the suspicion that *S. orbicularis* Anderss., *S. saximontana* Rydb. and *S. nivalis* Hooker are but variations in one direction or another from the typical form of *S. reticulata* L., becoming enlarged or depauperate and variously modified in accordance with shelter or exposure in the severe situations of high altitudes.

BETULÀCEAE

Birch Family

The members of the Birch Family are trees or shrubs of differing sizes and habits. Some are large forest trees with characteristic form and structure. Apical buds occur only in *Alnus;* the others lengthen by growth of one of the upper axillary buds. The leaves are alternate in position, plicately folded in the bud, mostly simple, pinnately veined, and doubly serrate or toothed. In the bud the leaf is enclosed by stipules, which fall away as the bud unfolds. The flowers, with either stamens or pistils but never both together, appear in catkin-like clusters on the same plant. The flowers are very small, in the axils of small, simple or compound scales, emerging in the early spring with or before the unfolding of the leaves, the staminate 1 to 3 in the axils of the scales of an elongated pendulous catkin, the pistillate in short capitate or cone-like clusters, erect in flower, consisting of small, overlapping, simple or compound scales, each subtending two or more flowers. The flowers are minute, with or without a calyx; in the staminate are 2 to many stamens with distinct filaments and erect anthers, which open by longitudinal clefts, the pistillate have a 2-celled ovary with short style and two elongated stigmatic branches which extend beyond the scale. The pistillate inflorescence matures in most cases into a cone-like structure with persistent or deciduous dry scales, each scale bearing 2 or more minute, 1-seeded, winged fruits. In some cases the wings are very narrow, in others broad and membranous.

The Birch Family is distributed almost exclusively throughout the North Temperate Zone in both the Eastern and the Western Hemispheres. In all there are six genera and about seventy-five species. Most of the genera have their representatives in Asia, Europe, and North America. There is sufficient evidence that this family enjoyed extensive circumpolar distribution in former geological periods.

In our own region the members of the Birch Family belong almost exclusively to two genera, the birches and the alders, both trees and shrubs. The Hazel Nut is found across the continent northward, but rarely occurs in the Rocky Mountains south of the international boundary. The birches and alders here form a large part of the vegetation along the banks of streams and lakes and on moist uplands.

KEY TO THE GENERA

Nut large, single, enclosed in a leaf-like envelope............ *Corylus*
Nuts minute, numerous, borne in a cone-like structure
    Cone scales deciduous.................................. *Betula*
    Cone scales persistent................................. *Alnus*

CÓRYLUS

HAZEL

The hazel genus consists of small trees or shrubs. They have broad, thin, finely toothed or cut leaves. The flowers are very small; the staminate appear in catkins, sessile on the ends of twigs of the previous season, exposed over winter, the scales of the inflorescence lying on the surface of its cylindrical form and constituting a compact covering. The staminate flowers open early, much before the leaves appear, each bearing 4 stamens cleft into two with filaments incompletely divided, each of the 8 anthers thus formed crowned by a tuft of hairs. These flowers have no calyx. The scales are 3-lobed. The pistillate flowers are within small, ovoid, scaly buds, clustered at the ends of short lateral leafy branches of the season. Each flower is in the axil of a bract and consists of an ovary, incompletely 2-celled and adnate to the calyx and bearing a short style and two slender stigmatic branches, which protrude from the top of the scaly bud. The scales are entire, but the two united bractlets enlarge in fruit, forming a leaf-like envelope for the nut. The nut is oblong or oval, with a thick fleshy embryo.

Numerous varieties of hazels are cultivated in Europe for their nuts and some are grown for the ornamental qualities of their foliage. There are seven or more species, two of which, or possibly three, are known to North America. The following appears in the northern Rocky Mountains.

Corylus rostràta Ait.

Hazel Nut. Fig. 13

A shrub 6 to 15 feet in height with numerous ascending stems, smooth grayish bark and hairy twigs; leaves ovate or oval, taper-pointed at the apex, cordate or obtuse at the base, 2½ to 4 inches long, the margin cut into sharp-pointed, forward-directed teeth, the upper surface smooth or with some scattered, appressed hairs, sparingly hairy beneath; bracts of the nut envelope bristly-hairy, united to the summit and prolonged into a tubular beak, about twice as long as the nut, raggedly cut at the summit; nut about ½ inch long, ovoid, marked with longitudinal striations.

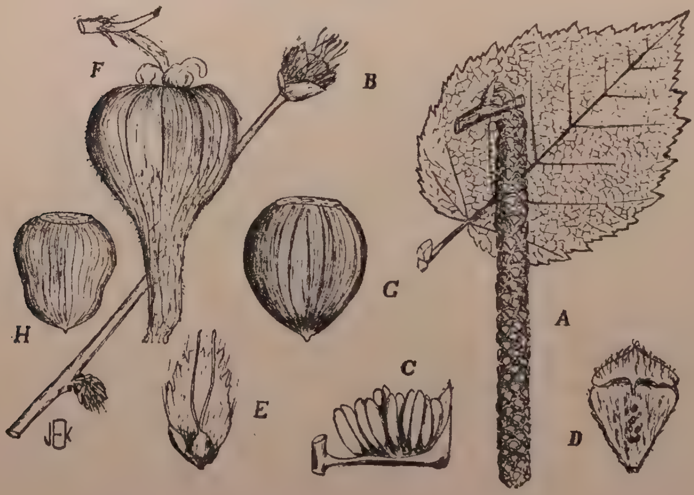

Fig. 13.—*Corylus rostrata* Ait. Hazel

Leaf about one-half natural size. *A* and *B*, male and female inflorescence, respectively, about natural size. *C* and *D*, stamens and supporting bract, ×8; *E*, pistil and bract; *F–H*, fruit with and without involucre, natural size.

This hazel, sometimes called the Beaked Hazel, is found from Nova Scotia westward through the British provinces to the Pacific Coast and southward into the Dakotas, the Rocky Mountains, and Oregon, at ordinary altitudes.

BÉTULA

Birch

The birches are trees or shrubs, our species mostly with bark smooth except on the oldest trunks, and conspicuously marked by lenticels. The bark is rich in volatile oil, thin and fibrous; the young twigs are often slender and pendulous, usually smooth but sometimes encrusted with resinous exudations. The winter buds are elongated, sharp-pointed, and covered by several brown, ovate, overlapping scales. The leaves are in alternate position, on distinct or relatively long petioles, the blade folded in the bud, variously toothed or cut, ovate or oblong in form, and with papery stipules. The flowers are borne in catkins, the lateral members of which are 3-flowered clusters (cymes) subtended by a lobed bract. The staminate catkins are usually long, cylindrical, and pendulous, composed of the immature flowers and their attendant scales and located near the ends of the branches, where they hang exposed during the winter. Each staminate flower consists of a calyx unequally 4-lobed or sometimes 2-lobed, and 4 double stamens standing opposite the calyx lobes. The double stamen is formed by the longitudinal cleavage of a single normally 4-lobed anther and its filament. The pistillate catkins emerge singly from the lateral winter buds back of the staminate catkins and are usually accompanied by a pair of leaves, the whole borne on a short spur shoot. They are usually stalked, narrow, and cylindrical, and composed of sessile flowers and bracts. The flowers consist merely of the minute compressed ovary, forked styles, and linear stigmas, which in flowering time are considerably elongated beyond the edges of the accompanying scales or bracts. The fruit ripens as a minute compressed nut, winged on the margin and bearing at its apex the withered but persistent stigmas. The scales of the catkin enlarge in fruit into dry, 3-lobed structures, which readily part from the axis, thus liberating the "seeds," as the small nuts are commonly called. These winged fruits are shed usually in early summer and ordinarily germinate at once in the moist conditions where they grow, thus allowing the seedling to become established in the same season in which the seed is borne. The seeds have a very short period of viability.

About thirty-five species of birch are definitely known, though less conservative estimates would probably place the figure somewhat higher, for the great variability of the birches and their apparent susceptibility to the influences of the habitat make some of the species very hard to define. Besides the existing forms, somewhat over forty species of *Betula* are known from ancient and more recent geological formations of both the Old and the New World.

The genus has a wide geographic distribution throughout the north temperate and the sub-arctic regions of Europe, Asia, and North America. The Paper Birch is said to extend as far north as any woody plant in North America. A few species range southward along the cooler elevations of the Rocky Mountains and supply a large element in the stream-side vegetation of the region.

Betula is the ancient Latin name at last permanently established by Linnaeus, who described *Betula alba,* the European White Birch, as the type of the genus. The birches are widely planted for ornamental purposes, the forms of the trees, the color of the bark and foliage, and their hardiness and adaptability to cold climates making them especially desirable for park and landscape planting. Especially favored are the weeping form of the European White Birch, and two or three Asiatic species. Besides their value for ornamental planting, the birches have a wide range of minor uses. The wood is hard and tough and is used in the manufacture of furniture, various turned articles, baskets, canoes, fuel, charcoal, etc. Also the bark of some species is used in tanning, that of others for the production of volatile oils, etc.

KEY TO THE SPECIES OF BETULA

Bark on old trunks in thin papery layers	
Bark white	1. *B. papyrifera*
Bark golden brown	2. *B. occidentalis*
Bark on trunks not peeling in thin layers	
Leaves commonly 1 to 3 inches long	3. *B. fontinalis*
Leaves less than 1 inch long	4. *B. glandulosa*

1. **Betula papyrífera** Marsh

Paper Birch

A forest tree reaching 75 feet in height and a stem diameter of 2 to 3 feet. In its best development the trunk ascends in smooth and cylindrical form, covered by a smooth white bark marked by long, transverse, yellowish lenticels, and separating readily into thin, papery layers. In youth the tree has a narrowly conical form with excurrent stem, but later it often assumes a rounded or less symmetrical form of crown. On young twigs the bark is gray or brown, dotted with frequent yellow glands, at first pubescent but becoming smooth with age. Winter buds are acute, chestnut-brown, about ¼ inch long, gummy and sometimes slightly hairy near the base. Leaves are ovate, acute or taper-pointed, 2 to 4 inches long, 1 to 2 inches wide, usually rounded at the base, sometimes broadly wedge-shaped, often densely serrate on the margin with sharp teeth, slightly hairy when young, usually smooth at maturity except for a few long hairs in the axils of the veins beneath, thickly dotted beneath when young with minute round glands, which persist until maturity; petioles at first rusty pubescent, later becoming smooth; stipules ovate, acute, ciliate on the margins; staminate catkins short, cylindrical, grouped, dark brown, becoming when fully open 3 inches or more in length and ¼ inch thick, exposing the yellow stamens; pistillate catkins narrow, cylindrical, an inch more or less in length, with long-pointed green scales and bright red stigmas; fruiting catkins reach a length of 1½ inches and a thickness of ⅛ inch and are borne on a slender stalk, the middle lobe of the scale long and sharp-pointed, the lateral ones rounded or ovate, all margined with cilia; the nut is oval, narrower than its broad wings. The flowers open with or before the leaves in early spring.

The Paper Birch has a wide range in North America, being found from Newfoundland to Alaska, south to Pennsylvania, Michigan, Nebraska, and the Black Hills, in the Rocky Mountains to Colorado, and on the Pacific Coast to Washington. In the northern Rockies it occurs sparingly south of the Flathead valleys, but is one of the commonest trees on the slopes and bottoms of the northern ranges tributary to the Flathead and the Kootenai rivers. In Montana it has been collected at Columbia Falls, in the Little Rocky Mountains, and in Glacier Park. It occurs abundantly throughout the Canadian Rockies.

Betula papyrifera was first described by Marsh in 1785 and was one of the first American trees to become known. It was at first thought to be identical with *B. alba* of Europe, the first tree to become identified with the genus, but it has long been accepted as distinct. It has also been known as *B. papyracea.* The tree is of peculiar interest for its usefulness to the primitive races for canoes and baskets, its beauty as a forest tree, and its minor economic utilities. The beauty of its bark makes it a favorite in the construction of rustic porches, benches, and the like, in the building of summer camps.

2. **Betula occidentàlis** Hook.

Western Birch

A large tree, reaching, in its best development, 100 feet in height and a trunk diameter of 3 to 4 feet, but smaller in the Rocky Mountains, with a high crown and pendent minor branches; the bark has a golden brown or yellowish cast, marked by long transverse lenticels and separating into thin, papery sheets, on the younger branches pale orange-brown, sprinkled with minute glands; winter buds are acute, ⅛ to ¼ inch long, dark brown; leaves 2 to 3 inches long, 1½ to 2 inches wide, ovate, acute at apex, usually rounded or obtusely angled at the base, coarsely and obscurely doubly serrate, with straight, slightly incurved glandular teeth, firm in texture, dull dark green above, yellowish-green below, mostly smooth on the upper side but hairy on the lower on the sides of the primary and secondary veins and in their axils; petioles about ¾ inch long, pubescent; stipules oblong-obovate, sharp-pointed, hairy on the margins, about ½ inch long; staminate catkins in winter condition about ¾ inch long, cylindrical, with faintly pubescent scales rounded or acute at the apex, in flowering 3 to 4 inches long and as much as ¼ inch thick; pistillate catkins narrowly cylindrical, less than 1 inch long, with sharp-pointed, green scales; fruiting catkins stalked, oblong-cylindrical, reaching sometimes 1½ inches in length and a diameter of ½ inch, the scales hairy on the margin, the middle lobe longer and more pointed than the lateral, the lateral ones ovate, oblong, extending down along the stalk; nut oval, nearly as wide as the wings.

The range of this species as now understood is from the Fraser River and southwestern British Columbia to northwestern Washington and eastward to the Rocky Mountains, where it occurs on the eastern shore of Flathead Lake; in the Canadian Rockies, from Golden to Selkirk Summit.

The first authentic collections of this species were made by Dr. John Scouler from near the Straits of Juan de Fuca on the northwest coast in 1825–1827, and the specific description was written by Hooker in 1839. Much of the material in herbaria and described in manuals under the label *B. occidentalis* Hooker is *B. fontinalis* Sarg., which is synonymous with *B. occidentalis* Nutt., owing to the mistake of Nuttall in regarding the plant collected on the Sweetwater in Nebraska as the same as Hooker's specimens and the failure of some subsequent authors to distinguish between the two quite different species of Hooker and Nuttall. A tree described by Butler under the name *B. montanensis* appears to be *B. occidentalis*. The writer's observations of what seems to be Butler's *Betula montanensis* in its type locality support the statement that the structure of the bark is very similar to that of *B. papyrifera,* peeling off in thin layers, a character denied in the description of *montanensis.* The leaves of this tree are apparently not accurately figured by Butler, though the bract is.

3. **Betula fontinàlis** Sarg.

Western Red Birch. FIG. 14

A tall shrub, 10 to 25 feet in height, with several stems up to 6 inches in diameter from a common base, with spreading top and numerous slender twigs which either extend straight and wand-like from the branch or, in some cases, hang supple and pendulous. The bark on older stems is a very dark gray or brown, merging into lighter and more lustrous shades on the branches; the youngest twigs are dull gray and slightly hairy, older ones a shining reddish-brown with oval, transverse lenticels, minute leaf-scars, and small resinous lumps (glands). The winter buds are slender, taper-pointed, sometimes curved, with several overlapping scales with ciliate margins; leaves 1 to 2 inches long, ½ to 1½ inches wide, broadly ovate, varying from the usual acute to obtuse or even rounded at the apex, usually obtuse or rounded at the base, the margin evenly or doubly serrate, nearly entire about the base, the lateral veins distinct, straight, forming a sharp angle with the midrib, surface at maturity smooth on both sides or bearing beneath a few slender whitish hairs and frequently glandular dots of darker color present often on the petiole as well, color deep green above, somewhat paler beneath; petiole generally half an inch or less in length, slender, flattened above; stipules at first green but later papery, broadly ovate in form, acute and slightly ciliate; staminate catkins clustered, cylindrical, less than 1 inch long during winter, becoming in flowering 2 or more inches long and ⅛ inch thick, with brown, sharp-pointed scales; the pistillate catkins stalked, ¾ inch or less long, showing the bright red stigmas projecting from beneath ovate, acute, green scales; fruiting catkins 1 inch, more or less, long, about ¼ inch thick, finally drooping; scales with 3 unequal points, the central longer, slender, lanceolate, the lateral broadly ovate and acute, all fringed with cilia; 2 or 3 nutlets are borne on each scale, the body obovate, topped by the persistent stigmas and a tuft of white hairs, and flanked by broad membranous wings, the whole pale brown in color. The flowers appear in early spring and ripen before midsummer.

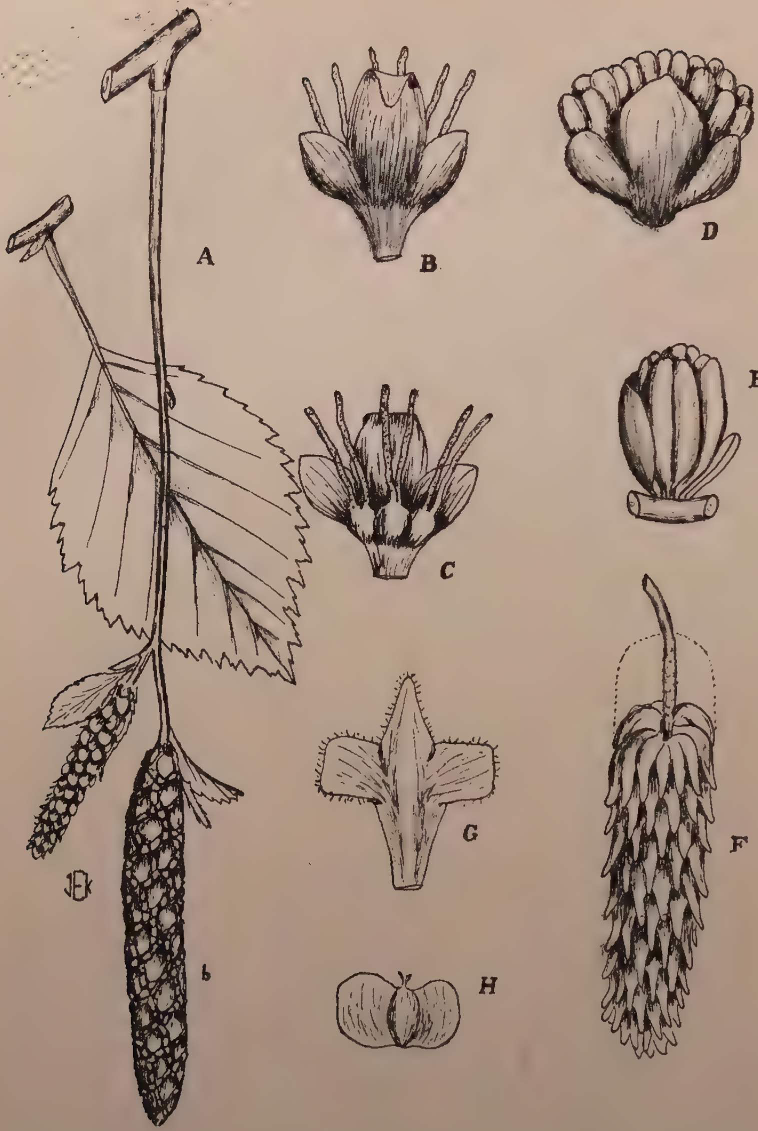

FIG. 14.—*Betula fontinalis* Sarg. Western Red Birch

Leaf natural size. *A,* shoot with pistillate inflorescence at *a,* and staminate at *b,* ×2; *B* and *C,* lower and upper sides respectively of the compound bract, bearing three pistillate flowers; *D,* compound bract bearing three staminate flowers, and *E,* one of these staminate flowers with calyx, ×8; *F,* cone, part of the bracts having been shed, ×2; *G* and *H,* bract and fruit respectively, ×4.

The Western Red Birch is distributed from the valleys of the Peace River and British Columbia in the north to New Mexico, Arizona, and California. It is abundant along all the streams on the western slope of the Continental Divide in Montana and is the only species common south of the Flathead valleys. It is also frequent over a much wider range and has been found in many places in the Rocky Mountains. It was first collected and described by Nuttall in 1842, who found it growing along the Sweetwater, a tributary of the Platt in Nebraska. In Montana it is known from Emigrant Gulch, Park County, Cinnabar, Bozeman, Great Falls, Belt River, Missoula, and the Bitterroot, Blackfoot, and Flathead valleys. In the British possessions it has been reported from the Selkirk Mountains and the tributaries of the Saskatchewan and Columbia rivers. It is found chiefly along lakes and water courses and in soil perennially moist.

About the same time Nuttall collected in the Rocky Mountains another brich which he named *B. rhombifolia,* and said it was found from the central Rocky Mountains to the banks of the Columbia. In the light of later knowledge, however, this seems to be but a form of *fontinalis.* Slight differences have also been made the basis for several more recent specific descriptions, which in view of the prevailing variability of *B. fontinalis* may be regarded with doubt as constituting really distinct species; such are *B. Sandbergii* Britton, *B. Elrodiana* Butler, *B. obovata* Butler, and *B. crenata* Rydberg.

4. **Betula glandulòsa** Michx.

Scrub Birch

A low shrub less than 6 feet high, erect or sometimes procumbent in exposed situations; bark smooth, dark chestnut-brown, twigs densely glandular, covered with minute resinous dots, the young twigs often covered with an ashy-gray film and slight pubescence, which gradually wears off, exposing the darker permanent bark; winter buds are about ⅛ inch long or less, dark, broadly oval or nearly globular, the margins of the scales ciliate; leaves usually less than ½ inch long, but occasionally larger on vigorous shoots, broadly obovate to orbicular, rounded at the apex, usually wedge-shaped but often rounded at the base, smooth on both sides, dark green above, pale beneath; petioles reddish, ⅛ inch long, more or less; staminate catkin usually single near the end of the shoot, in winter about ½ inch long, cylindrical, dark, with closely overlapping ciliate scales; pistillate catkins numerous, on short pedicels, in fruit sometimes reaching an inch in length but usually less, from ⅛ to ¼ inch thick; scales usually smooth, forked above the middle into three nearly equal and nearly parallel branches, which are rounded or blunt at the ends; the nutlet is oval, smooth, brown, and with narrow wing. Flowering and fruiting from June to August according to altitude.

The Scrub Birch has a wide geographic range from Greenland to Alaska and southward in the higher mountains of Maine and New York and in Michigan and Minnesota, in the Rocky Mountains to New Mexico and on the Pacific Coast to California. In the northern Rocky Mountains it has been collected in Yellowstone Park at Lone Star Geyser, in Montana on Sun River and Cutbank Creek, at Virginia City, and in Park County; in the British possessions, at different places from Morley to the Columbia Valley and the Mackenzie. Its favorite habitat is sub-alpine valleys.

ÁLNUS

ALDER

The alders are trees or shrubs, the former reaching 75 feet or more in height. In the Rocky Mountains, however, they are usually widely branching shrubs, though attaining a height of from 20 to 30 feet. The bark, even of old stems, is generally smooth, gray without, sometimes red within, dense and brittle. The wood is of rapid growth and brittle. The twigs, usually pubescent, bear on short stalks lateral winter buds, the first and subsequent leaves of which are covered by their own stipules; the leaves are folded like a fan in the bud and shed the stipules as they unfold. The leaves of alders are approximately oval in outline, strongly pinnate-veined, the lateral veins extending to the toothed margin. The flowers, partly developed during the preceding season, are borne in staminate and pistillate catkins, both kinds exposed during the winter. They are usually borne in clusters near the ends of the branches. In the winter condition the staminate catkins are cylindrical, reddish-brown, the pistillate of the same color but much smaller, oval or oblong, with overlapping, regularly arranged scales. The catkins of both kinds represent a central axis to which are attached a series of short lateral branches bearing one terminal and 4 lateral bracts and 2 pistillate or 3 staminate flowers. In the case of pistillate catkins the terminal bract forms the protective scale, in the staminate catkin the terminal bract is the most conspicuous, but the 4 others share the protective function, as do also the exposed sepals of some of the flowers. Early in the spring the flower buds expand. The pistillate catkins become slightly enlarged and erect, the stigmas protruding as 4 red, finger-like bodies. The staminate catkins elongate to 3 or 4 times their winter length and the pollen, already fully formed in the preceding autumn, is freely scattered to the wind. The staminate flowers are very simple structures consisting of 4 sepals and 4 stamens opposite each and resting on its concave inner face. Three of these flowers are borne on each scale of the catkin. The pistillate flowers are still more simple, consisting merely of a minute 2-celled ovary surmounted by 2 large stigmatic branches. Two of these are borne on each scale of the pistillate catkin.

Upon pollination the pistillate catkin immediately begins to grow and soon reaches its full size as a hard, green, oval fruit half an inch long. Maturity is reached in the latter part of the summer or early fall when the cone turns brown in color and woody in texture. The scales of the cone now become slightly reflexed, releasing the small fruits, which may be carried some distance by the wind or other agencies. The fruits proper are small brown nuts, slightly winged by a membranous margin, and bear at their summits the traces of the persistent styles. These fruits are borne in pairs on the upper surface of the compound scale of the cone. The fruits are single-seeded, and the seeds have a very brief period of viability.

The genus *Alnus* is widely distributed throughout the temperate regions of the Northern Hemisphere, and in America extends through the mountainous tropics and the Andes to Bolivia. The number of species is variously placed at from fifteen to thirty, accrediting eleven to the United States, of which three of tree form and two shrubby species occur in the Rocky Mountains.

That they were conspicuous throughout the Arctic regions in past geological time is indicated by over thirty species in fossil form from the strata of the Tertiary.

The various species are similar in their choice of habitat, growing usually in moist situations along streams or lakes or in swales at ordinary elevations, and at higher altitudes on slopes subject to heavy precipitation. Alders are planted to some extent for landscape effects, but they have a very limited range of economic use.

KEY TO THE SPECIES OF ALNUS

- Flowers expanding before the leaves
  - Leaves usually lobed, doubly serrate
    - Leaves often pubescent above as well as beneath..... 1. *A. incana*
    - Leaves usually smooth above and below, except on the veins .... 2. *A. tenuifolia*
  - Leaves rarely lobed, but dentate or serrate.............. 3. *A. rhombifolia*
- Flowers expanding with the leaves
  - Leaves irregularly serrate, often unequal at the base..... 4. *A. Alnobetula*
  - Leaves sharply doubly serrate, wedge-shaped or rounded at the base.................................... 5. *A. sinuata*

1. **Alnus incàna** (L.) Willd.

Gray Alder

A shrub or rarely a tree 12 to 18 feet in height with gray or ashy bark; leaves oblong, acute at the apex, hairy beneath, the axils of the veins without hairs; leaves not glutinous, those of young plants smooth or glaucous beneath; petioles ⅛ to 1 inch long; stipules lanceolate, persistent; staminate aments 1 to 3 inches long, pistillate catkin ovoid ½ inch or less in length in fruit, bracts 5-toothed; nutlet orbicular, leathery margined.

This species is common in the mountainous parts of Europe and in the northern latitudes of North America and Asia. In North America it is found abundantly throughout Canada to the base of the Rocky Mountains and south to Pennsylvania and Nebraska. Up to the present time no record appears of its having been found in the Rocky Mountains south of the British boundary.

2. **Alnus tenuifólia** Nutt.

Thin-leaved Alder. FIG. 15

A shrub or small tree with open crown and widely spreading and ascending branches; bark smooth, dark gray, diminishing to thin and dark brown or gray on the widely forking twigs, which are often pubescent with rusty hairs, which sometimes extend to the winter buds, and marked by round lenticels and reniform leaf-scars; winter buds oval, one-sided, containing several folded leaf rudiments heavily coated with gum; leaves 1½ to 4 inches long, 1 to 2½ inches wide, broadly ovate, acute or obtuse at the apex, with rounded, unequal, or sometimes cordate base, margin doubly serrate, the serratures often large, slightly hairy on the upper surface, especially along the veins, and on the lower often wooly along the veins, veins impressed in the

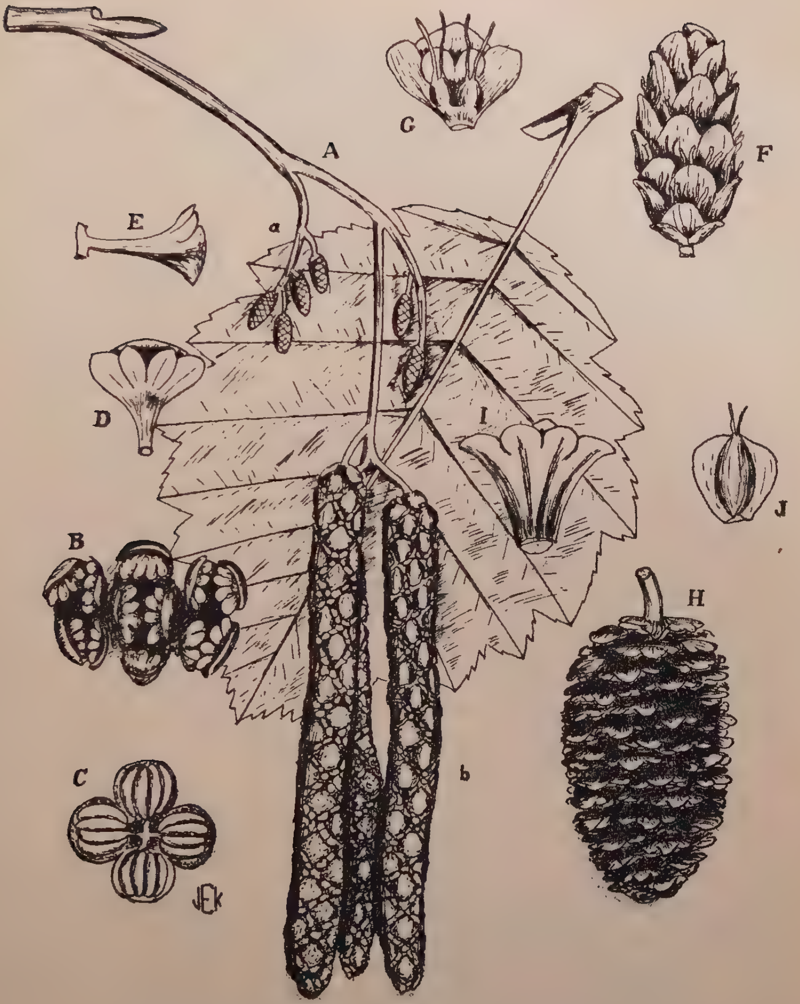

FIG. 15.—*Alnus tenuifolia* Nutt. Thin-leaved Alder

Leaf and twig, *A,* natural size; *a,* pistillate, *b,* staminate inflorescence in winter condition; *B,* cluster of staminate flowers as they appear on the bract, and *C,* a single staminate flower, ×6; *E* and *D,* top and lateral view respectively of the compound bract from the staminate inflorescence, ×6; *F,* pistillate inflorescence, ×4; and *G,* compound bract and two pistillate flowers from same, ×8; *H,* cone, ×2; *I* and *J,* bract and fruit ("seed") respectively, ×4.

upper surface, outstanding beneath, plainly netted; petioles ½ to 1 inch long, grooved above, hairy; staminate catkins usually less than 1 inch long, ⅛ inch thick, cylindrical, 3 to 4 clustered near the end of the twig, purplish, on short, red or brown, sometimes bracted pedicels, in flowering becoming 1½ to 3 inches long; pistillate exposed during the winter, in winter condition ⅛ inch long or less, dark, gum-coated, grouped in raceme-like clusters and often subtended by narrow bracts, in flower slightly expanded, stigmas protruding; mature cone oval, ½ to ⅝ inch long, with stout, distinctly 5-lobed scales; nutlet nearly circular, surrounded by a thin, membranous wing, and bearing at its summit remnants of the persistent styles.

This alder is found from Alaska to Lower California and eastward to Saskatchewan and the Rocky Mountains to New Mexico. It is the common alder everywhere along streams in Montana and extends northward to 61° N. latitude. In Montana it has been collected at Melrose, Spanish Basin, Mullan Pass, West Boulder, Bozeman, Fort Logan, Red Lodge, Missoula, and elsewhere. In the Canadian Rockies it is abundant on the higher slopes from Kicking Horse Lake to the Selkirks.

Alnus tenuifolia was first described by Nuttall in 1842 from material collected in the Blue Mountains of Oregon and the Rockies. In Nuttall's *Sylva* it is described as a shrub "about the height of a man," but subsequent observations have shown it to be much larger. It was formerly known under two varietal names, *glauca* and *virescens,* of *A. incana,* but these designations have become obsolete.

3. **Alnus rhombifòlia** Nutt.

White Alder

A tree, one of the largest of the genus, reaching in the region of its best development a height of 75 feet and a trunk diameter of from 2 to 3 feet; stems often straight, clear of branches for more than half their length and expanded above into an ample round-topped crown; bark brown, smooth, scaly on old trees near the base; ultimate branches pendulous, twigs at first pubescent, soon becoming smooth, dark red and marked by small scattered lenticels; winter buds ½ inch or less in length, slightly curved, slender, dark red, usually sparingly hairy or more pubescent toward the apex; leaves 2 to 5 inches long, 1½ to 3 inches wide, ovate or oval, sometimes very broadly so, acute or rounded at the apex, wedge-shaped or rounded at the base, margin finely sometimes doubly dentate or serrate, smooth and shining on the upper surface but usually green beneath and bearing pale hairs along the yellowish veins; lateral veins numerous, slightly curved toward the extremities and flanked by numerous small branches evident beneath; petioles up to an inch or more in length, hairy; catkins numerous, clustered near the ends of the branches, the staminate ½ to 1 inch long, cylindrical, dark and resinous coated, on short pedicels, enlarging to a length of 3 to 5 inches and diameter of ¼ inch when fully expanded, pistillate about ⅛ inch long in winter, narrow, ellipsoid, almost sessile, becoming in flower about double their winter dimensions; fruit may reach a length of nearly ¾ inch, oblong in form, on pedicels of moderate length, scales thick, with 5 terminal lobes; nutlet oval, scarcely winged but with a thin, rigid margin and persistent style remnants.

The White Alder is found from British Columbia to southern California and east to the northern Rocky Mountains in the Selkirk Range and in northern Idaho. It is doubtful if it is found in Montana.

On the coast this tree flowers in midwinter at low elevations, but later at more remote and higher situations. The fruit matures in early summer but remains closed until the following year. The Rocky Mountain form of the tree is doubtless much smaller than that which it assumes on the coast, where it often forms extensive and pure stands along streams.

This species was first discovered near Monterey, California, and was described by Nuttall in 1842.

4. **Alnus Alnobetùla** Koch.

Green Alder

A shrub or small tree with minutely pubescent and glandular twigs, which may become temporarily ashy gray but are finally brown and shining, freely branched and in the case of slow-growing twigs knotted by leaf-scars; winter buds oblong, acuminate, gummy; leaves often 2 inches long, 1 to 1½ inches wide, ovate, sharp at the apex, rounded or unequal at the base, margin with numerous sharp and irregular serrations, the principal veins impressed above, conspicuous beneath, forming a sharp angle with the midrib, surface of young foliage glutinous and more or less hairy, becoming in age nearly smooth on both sides, but usually pubescent along the veins and in the axils of the veins beneath; petioles ⅛ to 1 inch long, pubescent, grooved above; catkins expanding with the leaves in spring, the staminate slender, naked, 2 or more usually clustered near the ends of the branches, 1½ to 3 inches long, slender, naked; the pistillate emerging with the leaves from winter buds, arranged in an open and often leafy bracted panicle, becoming in fruit ½ to ⅝ inch in length and oblong or oval in form; nutlet oblong or oval, about as broad as the body. Flowers open very early in the spring, the fruit maturing in early summer.

The range of *Alnus Alnobetula* is circumpolar and from within the Arctic Circle south through the cooler parts of the North Temperate Zone, in North America extending from Newfoundland to Alaska and to New York and Michigan and in the high Alleghenies to North Carolina, in the Rocky Mountains of British America and in Montana at elevations of 3,500 feet or more. On mountain sides, sloping to the Little Kootenai in Glacier Park, it forms extensive thickets in a procumbent thatch, dense and impenetrable. In the Canadian Rockies it occurs at Emerald Lake.

The Green Alder has been known to botanists under one name or another since it was first described in 1788. The present name was given by Koch in 1872, superseding *A. viridis,* by which the plant is still frequently known. Segregates from this species have been proposed, especially *A. fruticosa* Rupr. and *A. sitchensis* Sarg., concerning the validity of which, however, authors are not agreed, and it is difficult to determine by comparison of descriptions and material from various localities the exact lines of cleavage between them. *A. sitchensis,* if distinct, comes within our range as a shrub of the northern mountains, but elsewhere nearer sea-level becomes a tree.

5. **Alnus sinuàta** (Regel) Rydb.

Mountain Alder. Plate 14

A shrub a few feet in height with older bark grayish, the younger brown, shining and nearly or quite smooth; leaves 1 to 3 inches long, ovate, acute or sometimes short taper-pointed at the apex, rounded or approaching cordate at the base, sinuately lobed and sharply and doubly serrate, thin, shining, green on both sides but paler beneath, smooth above but with whitish hairs mostly in the axils of the veins beneath; petioles slender, grooved above, ¼ to ¾ inch long; staminate catkins an inch long or more, sessile; pistillate in raceme-like arrangement on long pedicels, sometimes with leaf-like bracts; cone ½ inch or more in length, ¼ inch, more or less, in breadth, ellipsoid, the scales thin, medium or light brown; nutlet pale brown, smooth, stigmas persistent, the body slightly obovate, the thin wings nearly as broad as the body.

The range of this species is from Alaska to Alberta and south to

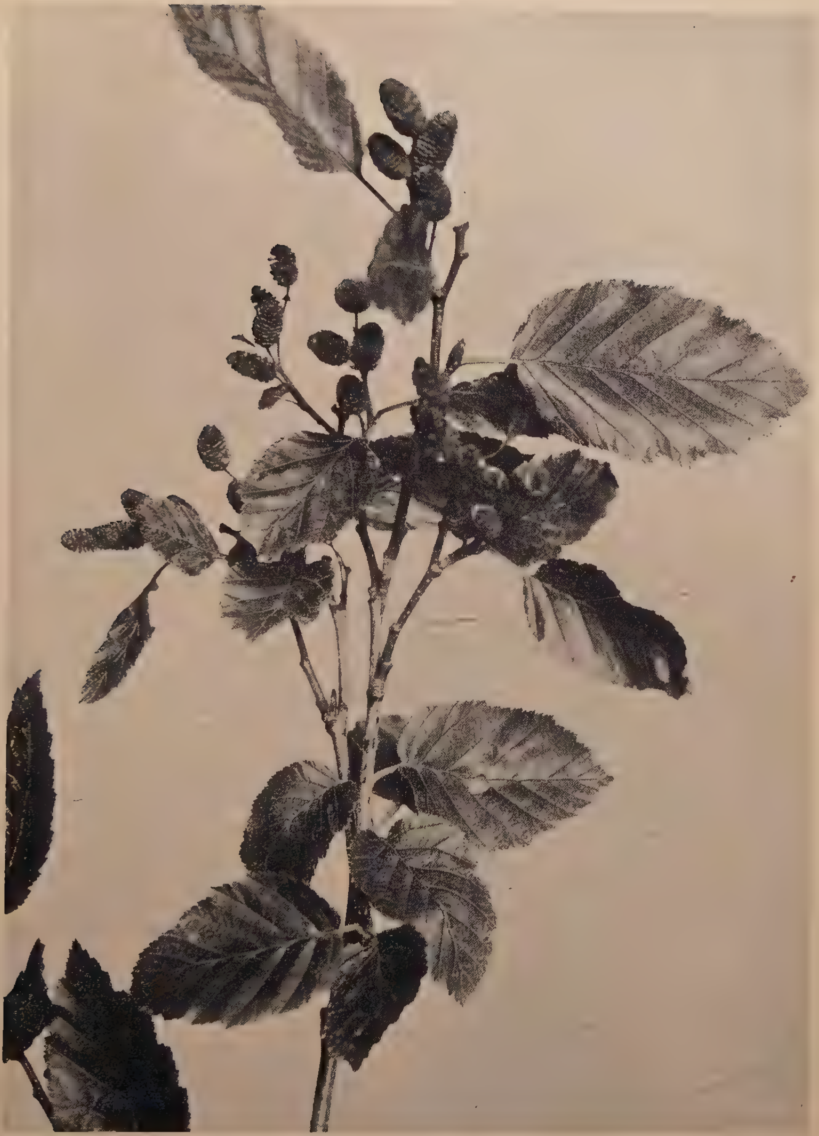

PLATE 14 (p. 110) *Alnus sinuata* (Regel) Rydb.

Mountain alder from the Bitterroot Mountains

Oregon and Wyoming. In Montana it has been collected in Spanish Basin, Emigrant Gulch, at Bozeman and Granite, and on the Jocko River, and by the writer in Glacier Park between Swiftcurrent and Ahern passes at an altitude of 6,200 feet and in the Bitterroot Mountains, Lolo drainage, at 6,500 feet on open slopes in sparse woods and old burns. In the Canadian Rockies it occurs at Emerald Lake.

A. sinuata was described by Rydberg in 1897. E. Regel in 1868 had named it as a variety of *A. viridis* DC., which it closely resembles and from which it may not be entirely distinct. The chief points upon which the distinction is based are the thin and shining surface and the lobed margins of the leaves.

CHENOPODIÀCEAE

Goosefoot Family

The Goosefoot Family is composed mainly of annual or perennial herbs, but includes also a few woody plants of shrubby habit. As they grow usually in dry situations their roots extend deep into the soil. The often widely branching and stiffly rigid stems are round or angled and usually coated with a grayish mealy pubescence which gives to the whole plant a pale or faded green color. The leaves, in most cases alternate in position, are mostly simple, small, and entire, in some members reduced to mere ridges or teeth, in others rendered fleshy by the development of a copious water-storage tissue. Stipules are absent.

The flowers in this family are small, greenish in color, and usually in dense clusters, or sometimes solitary in the axils of the leaves. The arrangement in the floral cluster is that of a compact cyme of the dichasial type, i.e., the main axis of the cluster is terminated by a flower and gives rise below the flower to two opposite secondary axes which in turn are also terminated by flowers, and so on. There are no petals, but the calyx is lobed into 2 to 5 parts. The stamens are short, as many as the calyx lobes and opposite them, or sometimes fewer. Anthers are borne on the tops of slender filaments, and open lengthwise. The pistil is usually composed of two carpels, though sometimes of more, which are united by the margins to form an undivided ovarian chamber and a short style, bearing at the top an equal number of somewhat elongated lobes covered with stigmatic papillae, or bearing them only along their inner faces. A single ovule arises from the floor of the ovary and develops ultimately into a vertical or horizontal seed with endosperm and coiled embryo. The fruit ripens as a small closed capsule, to which the persistent calyx adheres, and often enlarges to form a wing-like appendage in the interest of seed dispersal.

It is a frequent condition in this group that stamens and pistils are borne in different flowers, either upon the same or upon different plants; sometimes flowers having both organs and those having but one kind are borne on the same plant. Considerable variation occurs in this respect, doubtless due in large part to the close crowding of numerous small flowers in the inflorescence. The separation of the floral parts insures a degree of cross-fertilization, which is further enhanced by the fact that even where pistils and stamens appear in the same flower they seldom or never are matured at the same time. Either the stamens ripen first and the pollen is discharged before the stigma becomes receptive, or the stigma develops earlier and receives pollen from other flowers before the accompanying stamens are mature. Wind apparently cuts little figure in pollen transfer in this family, but small bugs, flies, and other insects attracted by the nutritive materials found in and about the flowers or by the shelter which a large and closely crowded inflorescence affords, carry the pollen. Wind-pollinated plants normally open many flowers at the same time; such, however, is not the case in the *Chenopodiaceae,* but the contrary, and in a large cluster frequently all stages may be found from young buds to ripened fruit.

The members of this family are widely scattered throughout the temperate and subtropical regions of the world. They are characteristically plants of saline situations, flourishing along seacoasts and over wide reaches of alkali wastes in the interior of the continents, and are common wherever for any reason a more than ordinary amount of salts occurs in the soil. Some are not bound to saline habitats but spread rapidly as weeds in fields and neglected areas. The family as a whole seems to be one of comparatively recent origin and represents a type of vegetation expressing adaptability in large measure to life in the flat wastes with which apparently the story of their development is most closely involved.

About seventy-five genera and upward of five hundred and fifty species are now known, of which about six of shrubby form appear in the northern Rocky Mountains. Some members of the family in cultivation are highly useful and widely planted; such are the varieties of beets and spinach of the gardens, both of which have been developed from maritime species of southern Europe and southwestern Asia.

Key to the Genera

Branches seldom spiny
  Bracts flat or convex, not silky........................ *Atriplex*
  Bracts silky pubescent, folded lengthwise............... *Eurotia*
Branches spiny
  Fruit with narrow vertical wing........................ *Grayia*
  Fruit with a broad horizontal wing.................... *Sarcobatus*

ÀTRIPLEX

Saltbush

The species of this genus are mostly herbs, but the few shrubs native to the northern Rocky Mountain region are plants usually under 4 or 5 feet in height, with scaly or scurfy pubescence. The leaves are alternate, though some, especially the lower, are opposite. The flowers, which are either staminate or pistillate and may occur on the same or on different plants, are small, green, and assembled in terminal broom-like clusters or in smaller groups in the axils of the leaves. Staminate flowers are without bracts, with calyx 3- to 5-parted and an equal number of stamens. The pistillate flower has no perianth, but the pistil is enclosed by two bractlets more or less united and in the fruiting condition enlarged and often hardened. The pistil bears two stigmas almost sessile upon the ovary, which in fruit becomes a small dry, one-seeded, bladder-like pod, completely or partially enclosed by the bractlets. The seed is usually vertical, the embryo coiled into the form of a ring or spiral and embedded in mealy endosperm.

About one hundred and thirty species of Atriplex are known, of which about thirty-seven are reported from the Rocky Mountains. They are found throughout the temperate and subtropical regions of the whole world and are a common feature of the vegetation of the western plains and desert areas, especially in alkaline situations. They are plants of minor usefulness, a few serving as fodder under the name of saltbushes, some planted for ornamental purposes, and one a garden vegetable, the orache.

KEY TO THE SPECIES OF ATRIPLEX

Leaves mostly ovate.................................... 1. *A. confertifolia*
Leaves narrow
  Bracts of pistillate flowers smooth..................... 2. *A. canescens*
  Bracts appendaged on the back........................ 3. *A. Nuttallii*

1. **Atriplex confertifòlia** (Torr.) Wats.

Shad Scale

A pale yellowish-gray bush of rounded outline, 1 to 5 feet high, compact, with many slender, rigid, widely spreading branches, which are frequently turned into jointed spines by the shedding of leaves or fruits; leaves ¼ to ¾ inch long and vary from oblong to broadly ovate or spatulate, but the prevailing form is ovate with rounded or bluntly pointed apex and wedge-shaped base, the margin entire and petiole short; flowers appear in small axillary clusters, calyx 5-cleft; fruiting bracts sessile, broadly margined above and mostly obtuse, united at the cuneate base, about ⅜ inch broad; seed about 1/12 inch in diameter, filling the cavity.

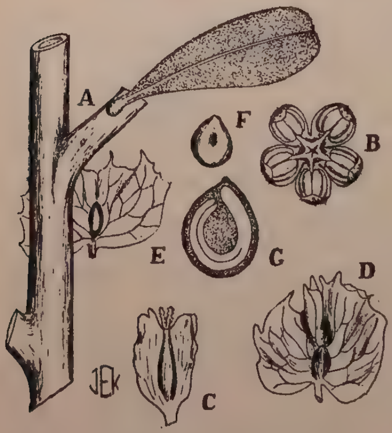

FIG. 16.—*Atriplex canescens* James. Saltbush

A, twig and leaf, ×2; *B,* staminate flower, ×10; *C,* immature fruit, ×2; *D* and *E,* fruit with enclosing bracts, natural size; *F,* seed, ×2½; *G,* same in section, ×10.

This species is abundant throughout the alkaline valleys of the Great Basin and the Rocky Mountains north to Montana and south to Mexico and west to California and Oregon.

It was described by Watson in 1874 and previously referred to under the generic name of *Obione.*

2. **Atriplex canéscens** James

Saltbush. FIG. 16

A shrub of grayish color and rounded outline, 2 to 5 feet high, freely branched and with somewhat rigid twigs, which show a tendency to transform into slender spines by the shedding of leaves and other members; leaves ½ to 2 inches long, oblong or linear to oblanceolate, rounded at the apex, narrowed at the base, entire, sessile; flowers usually of two kinds and born usually on separate plants, in small axillary clusters or in naked spike-like panicles, calyx 5-cleft; fruiting bracts at first ovate, becoming hardened and rigid, adherent below to the pedicel and contracted above to a very narrow orifice, slightly compressed in fruit and reaching a breadth of ¼ to ½ inch; seed ovate, small.

Atriplex canescens is common on plains and alkali lands from Montana to Mexico through the Rocky Mountains and westward across the Great Basin to California and Lower California. It was described first by James in 1874.

3. **Atriplex Nuttàllii** Wats.

Nuttall's Saltbush

A shrub 2 to 3 feet high with yellowish stems freely branched from the base, and seldom spiny; leaves 1 to 2 inches long, up to ½ inch in width, usually rounded at the apex, narrowed at the base, entire, grayish green, sessile; calyx 5-parted, bracts of the pistillate flower united to about the middle, open above, sessile, enlarging in fruit to a width of about ¼ inch, margin irregular, the surface usually bearing conspicuous teeth.

The species here described was first published by Watson in 1874 and is now known to occur on dry and saline soil from Saskatchewan to Nevada and west to British Columbia, Oregon, and California. It may be found in Montana on the Madison River and Belt Creek and near Great Falls, and in the Canadian provinces from Moose Jaw Creek to the Rocky Mountains, on Wood Mountain and Milk River Ridge, and in the salt marshes of the Saskatchewan and Slave rivers.

EURÒTIA

These are low shrubs, seldom herbaceous, with dense white pubescence covering stem and leaves. The leaves are entire, narrow, and alternate in position. The flowers are of two kinds, clustered in the axils of the leaves; the staminate, without bracts, have a 4-parted calyx and 4 stamens, which stand opposite the sepals and extend beyond them; the pistillate have no calyx, but the ovary is enclosed by 2 bractlets united nearly to the summits and covered with long silky hairs; the ovary is ovoid, sessile, the

2 styles projecting beyond the tops of the bracts. The seed stands vertical, and the embryo forms a ring embedded in the mealy endosperm.

Two species of *Eurotia* are known; one belongs to Europe and Asia, the other to western United States.

Eurotia lanàta (Pursh) Moq.

White Sage. Fig. 17

A shrub, usually under 3 feet, erect, much branched, with ascending, leafy stems, the whole plant covered with a dense coating of stellate hairs, white when young, becoming rusty brown with age; leaves narrow, linear, sessile, an inch, more or less, in length, the midrib prominent beneath, the margin entire and somewhat rolled toward the lower side; flowers forming dense paniculate clusters along the upper portions of the branches; the staminate flowers showing yellow stamens extending beyond the acutely ovate lobes of the hairy calyx; the bracts of the pistillate flower lanceolate, about ¼ inch long in fruit, with 4 dense spreading tufts of white hairs, the bracts closely fitting to the side of the pod.

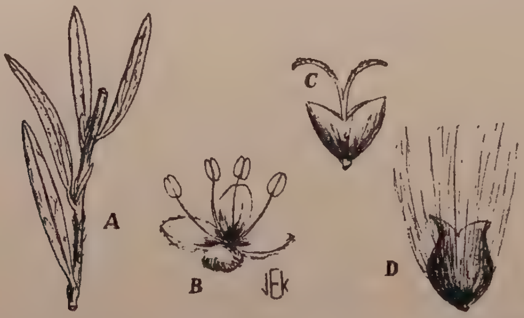

Fig. 17.—*Eurotia lanata* (Pursh) Moq. White Sage

A, twig, natural size; *B* and *C,* staminate and pistillate flowers respectively, ×8; *D,* fruit, ×2.

The range of the White Sage is from Saskatchewan to New Mexico and Texas through the Rocky Mountains and west to British Columbia, Oregon, and California. Melrose and Great Falls may be mentioned as localities in Montana, and, in the British possessions, the plains of the Saskatchewan, Walsh Station on the Canadian Pacific Railroad, and Milk River Ridge.

GRÀYIA

Grayia is a low, slightly spiny shrub with alternate, entire leaves. The small flowers, which occur in axillary clusters or terminal spikes, are of two kinds; the staminate with a 4- to 5-parted, membranous calyx and an equal number of stamens, and the pistillate, which has no calyx but a pistil almost completely enclosed by a pair of bracts, folded on their midribs and united almost to the summits. These bractlets enlarge with the growth of the fruit and continue to enclose it with a thin compressed envelope with a thin narrow wing. The pistil bears two stigmas and an ovary, which develops into a small pod containing a single verticle seed, with annular embryo embedded in endosperm.

Two species of this genus are known, both belonging to the Great Basin region of North America. One of these is found in the northern mountain ranges.

The genus was named for Asa Gray, eminent American botanist.

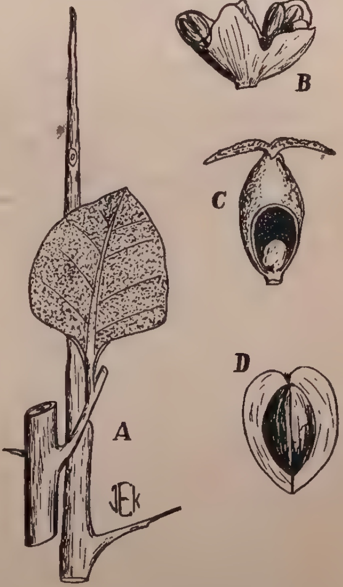

Fig. 18.—*Grayia spinosa* (Hook.) Moq. Hop Sage

A, twig (spine) and leaf, ×2; *B* and *C*, staminate and pistillate flowers respectively, ×7 and ×10; *D*, fruit, ×2.

Grayia spinòsa (Hook.) Moq.

Hop Sage. Fig. 18

A low, but erect, diffusely branching shrub with gray bark and straight, slender, rigid branchlets, which are transformed into spines by the shedding of leaves; leaves small, usually ½ to 1 inch long, or on vigorous shoots reaching 2 inches, spatulate or oblanceolate ⅛ to ¼ inch wide, rounded at the apex, narrowed to the sessile base, entire, smooth at maturity, scurfy pubescent when young; flowers minute, greenish, in dense clusters crowded to the ends of the branches in compact panicles, the staminate clustered in the axils of bracts or leaves, the pistillate mostly in spikes; bracts in fruit ⅜ to ½ inch wide, broadly oval or orbicular, notched at the top, smooth, united to the apex, with thin, uniform margin.

This shrub is found from Montana to Nevada and west to Oregon and California. In Montana it has been collected in Beaverhead County and at Glendive.

The first knowledge of this plant came from a few imperfect specimens collected by David Douglas on his first journey to northwestern America and noted by Hooker in 1840 as a doubtful species of *Chenopodium.* It was later collected in the valley of the Snake River and described by Hooker and Arnott in the *Botany of Beechy's Voyages* under the name *Grayia polygaloides,* for which the present name was substituted in 1890.

SARCOBÀTUS

A low shrub, erect, widely branched, with thin grayish or yellowish bark; the younger twigs become transformed into thorns by the shedding of leaves and the hardening of the points, the leaf-scars marking small elevations at the nodes. The leaves are sessile, linear, fleshy, and smooth. The small flowers are of two kinds, sometimes upon the same, sometimes upon different plants, the staminate forming a terminal spike, the pistillate sessile and solitary in the axils of the upper leaves. The staminate flower consists of a peltate stalked scale, beneath which stand a few stamens with short filaments but without a calyx. The pistillate flower has a cup-like calyx, undivided or scarcely 2-lipped, which fits snugly up to the ovary, with which it is partly united. The ovoid ovary is surmounted by a thick short style, which ends in two laterally extended, fleshy stigmas. In fruit the ovary wall forms a translucent testa and the margin of the adherent calyx becomes expanded into a broad, circular and irregular and membranous wing. The seed contains a spiral embryo, but no endosperm.

This is a monotypic genus, found only in the drier alkaline and saline soils of western North America. The name *Sarcobatus* comes from the Greek *sarkos,* fleshy, and *batos,* thorn, alluding to the fleshened leaves and the thorns on the stems.

The genus *Sarcobatus* was established by Nees von Essenbeck, who compiled the records of the travels of Maximilian, Prince of Neuweid, who visited the upper Missouri in 1823.

Sarcobatus vermiculàtus Torr.

Greasewood. Fig. 19

An erect shrub, 3 to 8 feet high, leafy, freely branched, the ultimate branchlets transformed into thorns by the shedding of the leaves, bark on young twigs yellow, on older stems gray; leaves ½ to 1½ inches long, linear, less than ⅛ inch wide, sessile, at first minutely hairy, later smooth; staminate flowers in terminal cylindrical spikes ½ to 1 inch long, the scales rhomboid ovate, acute, persistent, spirally arranged; pistillate flowers solitary in the axils below the staminate spike, the calyx close fitting to the ovary, its margin expanded in fruit into a leafy wing ½ inch wide, radially striate.

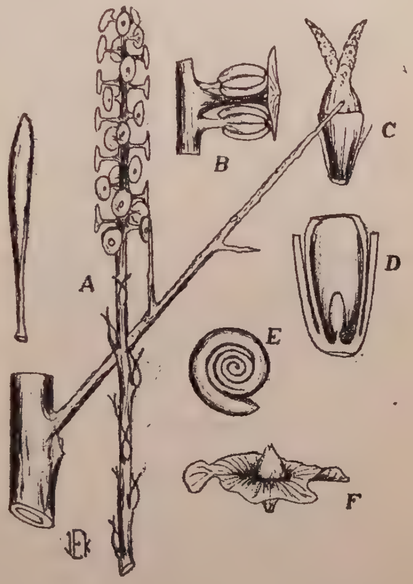

Fig. 19.—*Sarcobatus vermiculatus* Torr. Greasewood

Twig and leaf a little more than natural size; *A,* inflorescence, staminate scales above, pistillate flowers below, ×2; *B,* staminate flower, ×8; *C,* pistillate flower, ×5; *D,* section through same, ×10; *E,* embryo, ×5; *F,* fruit, ×2.

The Greasewood is distributed through the Rocky Mountains from Saskatchewan south to Nebraska and Texas, and west to Washington, Oregon, and California. In Montana it occurs on the bluffs about Glendive, at Great Falls, Belt Creek, and Ruby River. In British America it is found in the plains region east of the Rocky Mountains.

This plant was first collected by Douglas (probably about 1826), who found it growing in salt marshes along the Columbia River, and the original description of the species was written by Hooker under the name *Batis? vermiculata* in 1840. It was again brought to light by the collections of Long's and Emory's expeditions and described by Torrey under its present name in 1848. It was alluded to by Lewis and Clark as a "pulpy thorn." Its wood is used for fuel, where trees are scarce, and better fuel costly.

RANUNCULÀCEAE

Crowfoot Family

Most members of this group, which in the Rocky Mountains is abundantly represented, are herbs of the woods and meadows, but one or two genera of more or less woody climbing plants are common in the region and should be considered here.

The salient features of this family may be noted as follows. The leaves are usually alternate in position, especially in the herbaceous forms, but in the woody members are in whorls of two or three at rather distant intervals. The leaves, sometimes simple and entire, are often lobed or divided in palmate or pinnate fashion, commonly with distinct petioles but without stipules. The herbage usually has an acrid sap. The pubescence, when present, consists of simple hairs. The flowers are often large and showy, usually regular, and the corolla may be wanting and the calyx petaloid. The parts of the flower, especially the stamens and pistils, are more often spirally arranged and numerous than otherwise, sepals 3 to 15, and the petals likewise when present, inserted below the ovaries, the petals or sepals or sometimes both brightly colored. The pistils are usually numerous, 1-celled, bearing one or several ovules, consisting of 1 carpel, with short style and simple stigma. The pistil in most cases ripens as a dry, one-seeded achene or several-seeded pod, seldom as a berry. The seeds with endosperm.

The Crowfoot Family contains about thirty-five genera and over one thousand species of wide distribution throughout the North Temperate Zone. Many of them are among the most familiar of our common plants, both wild and cultivated for ornamental purposes, among which may be mentioned anemones, larkspurs, columbines, and peonies. Among the wild forms one author cites as many as twenty-three genera and one hundred and ninety species occurring in the Rocky Mountains.

Pollination occurs in the group mainly through the visits of insects, either in search of pollen in the case of nectarless flowers or for nectar, which is produced in the majority of our common plants of the family. In either case the anthers usually ripen first, and the pistils mature after the pollen is gone, thus insuring cross-fertilization. One of the features of this family is the frequent modification of the petals for the production of nectar, which appears in various stages from a simple glandular pocket on the upper side of the petal, as in *Ranunculus,* to complete transformation, as in *Aconitum.*

KEY TO THE GENERA

Flowers in clusters, white.................................. *Clematis*
Flowers solitary, purple.................................. *Atragene*

CLÉMATIS

The species of *Clematis* are climbing, woody vines. The leaves are opposite, divided into three main parts, which may be again divided in the same fashion, with leaflets entire or toothed. The flowers are borne in long pedicellate cymes in the axils of the leaves. Stamens and pistils may be borne in the same or in separate flowers, sometimes on separate plants. Petals are wanting. The sepals are small, petal-like, fitting edge to edge in the bud, spreading in flower. The many stamens radiate from the center of the flower, bearing short anthers on the ends of straight filaments. Pistils may be few or many. The fruit is a small, single-seeded achene formed by the ovary, topped by the elongated feathery style.

The genus *Clematis* is sometimes treated as including *Atragene.* In its broader use the name *Clematis* includes the many highly ornamental vines and other flowering plants of the gardens, which by some authors are assigned to other genera, *Atragene, Viorna,* etc. In the inclusive sense about one hundred and fifty species are known, of which about thirty are found in the United States. The majority are natives of eastern Asia.

Clematis ligusticifòlia Nutt.

Clematis. FIG. 20. PLATE 15

A woody vine, trailing on the ground or ascending bushes or trees to a height of 30 or 40 feet, with maximum stem diameter of about 3 inches. The young twigs are angled, brittle, smooth, and dull in color, the bark on older stems becoming gray and stringy; winter buds small, in the axils of persistent petioles, scales hairy, opposite, loosely overlapping and covering several layers of opposite inner members. The leaves are compound and have the primary segments again divided, blades of the leaflets 1½ to 2½ inches long, ¾ to 1½ inches wide, acute at the apex, usually rounded at the base, the margin divided into several prominent lobes or teeth, smooth or sparsely hairy, petioles long, wrapping like tendrils about twigs and other objects; flowers are borne in open, long-stalked, bracted cymes which arise from the axils of the leaves, the individual flower usually about ½ inch across; sepals greenish-white, oblanceolate, about ¼ inch long, spreading; stamens numerous, with broad filaments and short anthers; pistils many, slender, long silky pubescent, with short, curved stigma; fruit an ovoid ovary about ⅛ inch long, bearing at its summit the copiously hairy style elongated to 2 inches or more.

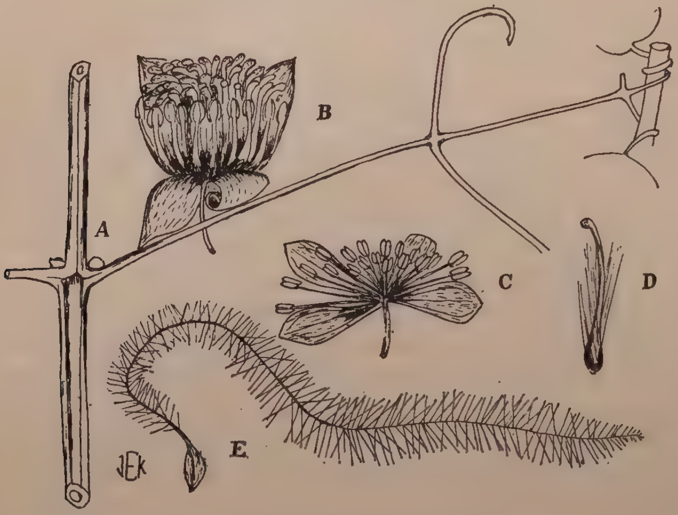

Fig. 20.—*Clematis ligusticifolia* Nutt. Clematis

A, twig, about two-thirds natural size; *B* and *C*, flowers, ×2; *D*, pistil, ×4; *E*, fruit, about natural size.

This species of *Clematis* is found from British Columbia to California and east to Assiniboia, North Dakota, and New Mexico. It has been collected in Montana at many places, including Lewis and Clark County, the Belt Mountains, Bozeman, and Missoula; and in the Canadian Rockies on the north shore of Waterton Lake.

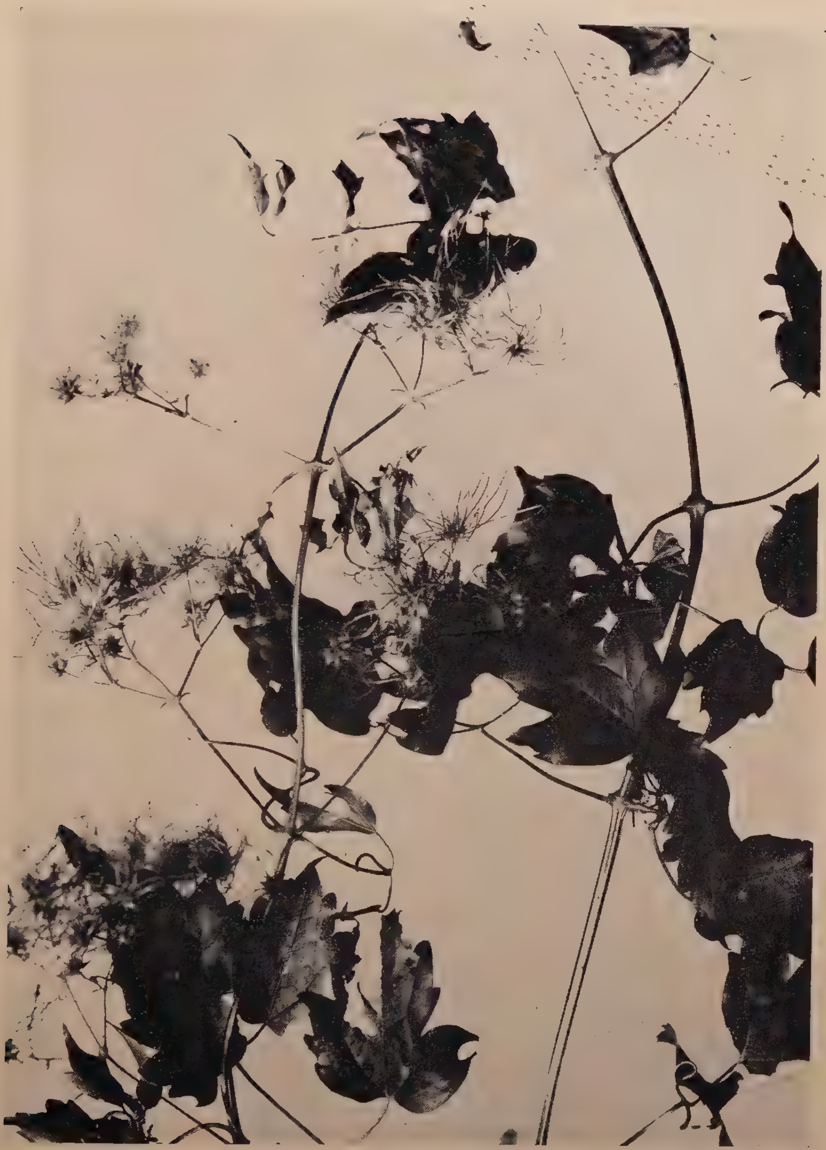

PLATE 15 (p.121) *Clematis ligusticifolia* Nutt.

Clematis from the vicinity of Missoula, Montana

In western Montana at elevations of about 3,000 feet it is one of the plants flowering early in the summer, and grows best along the river bottoms, where its long, rope-like stems may be seen reaching 40 feet or more into the tops of old cottonwoods.

Attention was first called to *Clematis ligusticifolia* by Nuttall in Torrey and Gray's *Flora* of 1838-1840. Another species is sometimes recognized under the name *C. brevifolia* (Nutt.) Howell, though sometimes this is regarded as merely a variety. It is much like the one here described, but is said to be smaller, having smaller leaves and shorter flower-stalks. Its range seems to be less extensive than that of *C. ligusticifolia,* being confined to Washington and Oregon and east to Montana and Utah.

ATRAGÈNE

This plant is a climbing vine with somewhat woody stems. The leaves are compound by division into three segments. The flowers are large, solitary in the axils of the leaves; the petals are wanting, but the sepals are petal-like, blue or purple, and spreading when mature. The stamens are many, with long filaments, which are slightly hairy and wider toward the outside of the series, showing gradual transition toward the sterile, spatulate, petaloid form. The anthers are short. Pistils are numerous, becoming in fruit one-seeded achenes with elongated, plumose styles.

Atragene columbiàna Torr. & Gray

Virgin's Bower. FIG. 21

A woody vine ascending over bushes and low trees, with striate, angled twigs; leaves compound, mostly bearing 3 leaflets, which are lanceolate or ovate in form, with acuminate apex and usually rounded base, the margin quite variably toothed or entire, the blade thin, green, smooth or with a few scattered hairs, primary petioles long, the secondary much shorter, both serving as tendrils; flowers solitary in the axils of the leaves, on long peduncles; calyx blue or purple, 4 sepals, 1 to 2 inches long, thin, lanceolate, veiny, sharp taper-pointed; stamens many, filaments broad, ciliate, anthers short, blunt, pointed above; pistils many, slender style and cylindrical stigma; fruit an achene, with one seed, the style elongating to form a plumose appendage about 2 inches long.

This plant is widely distributed throughout the Northwest from British Columbia to Alberta and south to Washington and Colorado. In Montana it has been found at Missoula, Deer Lodge, Bozeman, Ross Hole, and the Bridger Mountains, and in British America in the Rocky Mountains at latitude 56° N. (Mount Selwyn), also in the foothills of the Rocky Mountains on the 49th parallel and in Bow River Pass, Banff, and Field.

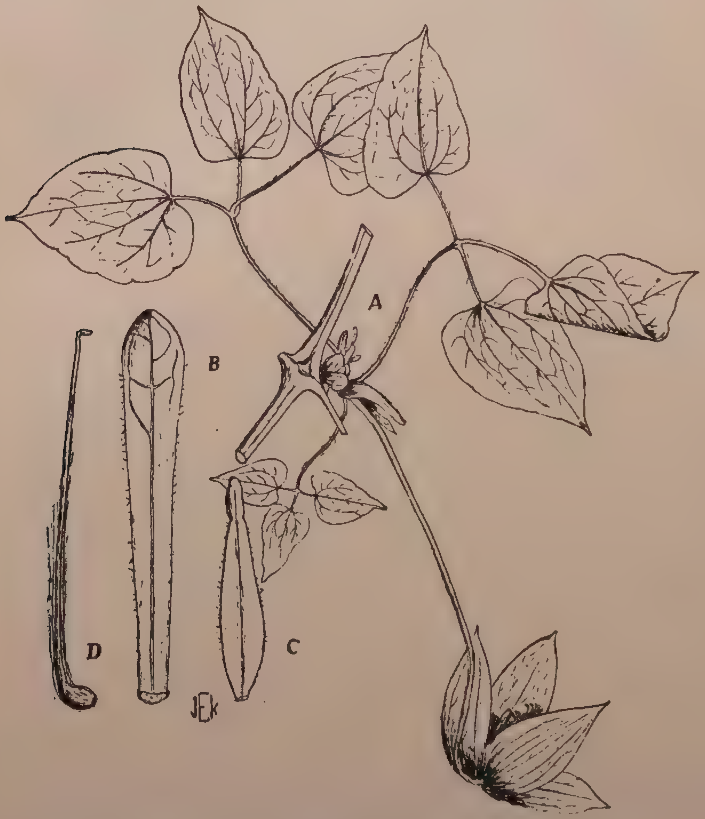

Fig. 21.—*Atragene columbiana* Torr. & Gray. Virgin's Bower
A, shoot, about two-thirds natural size; *B,* petal, ×3; *C,* stamen, ×4; *D,* pistil, ×4.

The species was first described by Torrey and Gray in 1838–1840, and was formerly known as *Clematis verticillata* var. *columbiana.*

BERBERIDÀCEAE

BARBERRY FAMILY

The plants of the Barberry Family are shrubs or herbs, ours only shrubs with yellow wood and alternate, compound, leathery, evergreen, spiny-toothed leaves. The flowers are small, yellow, usually in racemes, and consist of several whorls of three members each, except the pistil, which is simple. The calyx consists of 6 sepals alternating in two series and subtended by three or more small bracts; the petals also are six in number, appearing opposite the sepals. The pistil is short and oval, with broad, sessile stigma. Within the ovary, which is one-celled, the ovules are either basal or parietal. The fruit ripens as a capsule or berry and the seeds bear endosperm.

The *Berberidaceae* are widely distributed in the extra-tropical regions of the Northern Hemisphere and in the Andes and the Temperate Zone of South America. Their range extends from Central Asia to the high mountains of the tropical Indies and along the high mountain ranges of the Western Hemisphere to Tierra del Fuego. The greatest variety and abundance of the forms of this group are found in the lands tributary to the Pacific Ocean. At present there are recognized twenty or more genera and over one hundred and thirty species.

The fruits and herbaceous parts of the plants of this family contain free malic acid, and the bark of some species yields a bitter substance used medicinally and possessing properties similar to those of rhubarb. Among those best known for their medicinal qualities are the May Apple (*Podophyllum*), common throughout the Atlantic States and the Middle West, and the common Barberry (*Berberis vulgaris*) of Europe and Asia. The inner bark and wood is yellow and yields a dyestuff in the case of certain Indian and South American species of *Berberis*. Many species and varieties of *Berberis* are common in cultivation as hedge plants and for other ornamental purposes. In late years, however, federal regulations against their planting, with some exceptions, have been enforced, owing to their susceptibility to rust disease, which they assist in transmitting to grain crops. It may be added that the Japanese Barberry, so extensively planted as an ornamental, is not susceptible, and hence not "blacklisted" by government agents.

ODÓSTEMON

OREGON GRAPE

This genus comprises low shrubs with roughened, crooked stems and yellow inner bark and wood. The stems are usually procumbent and more or less trailing through the thin upper layers of leaf-mould or soil, branched into short shoots, which bear large alternate, crowded, evergreen leaves, pinnately compound, with a terminal pinnule and distinct petiole, the midrib jointed at the insertion of the leaflets, which are smooth, leathery, and margined by sharp, bristle-pointed teeth. The flowers are yellow, in racemes, which emerge from the axils of the scales of a terminal bud, composed of five or more whorls of members; the calyx consists of six sepals in two series of three each, falling away early, the corolla of six petals in two series of three each, each bearing two small glands on the upper side near the base, six stamens in similar arrangement, each anther opening by two uplifted valves and bearing at the apex a pair of divergent teeth, and the pistil with small oval ovary and sessile stigma. The fruit ripens as a small bluish berry about the size of a pea.

The genus *Odostemon,* sometimes known as *Mahonia,* represents a part of this group formerly included under *Berberis.* From the true *Berberis,* however, it is separated by the absence of spines and the presence of compound instead of simple leaves. Over twenty species are known from China and central Asia and western North America and Mexico, of which a few are found in the northern Rocky Mountains.

Under the most favorable conditions, such as obtain in the moist climate along the Pacific Coast in the Northwest, these plants may attain a height of 10 feet and a vigorous shrubby form; but in the Rocky Mountains they are much smaller and usually appear as very low undergrowth in open woods, their stature closely related to the moisture and richness of the soil.

The handsome evergreen leaves, which in mountain regions usually take on a reddish or brownish color in the autumn, make the Oregon Grape one of their characteristic shrubs.

KEY TO THE SPECIES OF ODOSTEMON

Leaflets pinnately veined.................................. 1. *O. Aquifolium*
Leaflets strongly 3-nerved from the base.................. 2. *O. nervosus*

1. **Odostemon Aquifòlium** (Pursh) Rydb.

Smaller Oregon Grape. Fig. 22

A procumbent shrub of open, irregular, branching habit, leaves evergreen, alternate, with round, smooth petioles, odd-pinnate, with leaflets sessile and opposite on the midrib, oblong-ovate in form, the base obliquely truncate, the texture leathery, surface smooth above and beneath, the margin undulate, bristle-toothed; flowers in compact bracted racemes from buds of the previous year, yellow, bearing a few small, early deciduous bracts below the calyx; calyx spreading, open, deciduous, with 6 oval or nearly orbicular sepals; petals 6, curving upward, oblong; stamens 6, shorter than the corolla and standing opposite its lobes, the anthers 2-lobed; pistil 1, stigma broad; fruit a few-seeded, globular berry, very acid and covered with a marked bluish bloom.

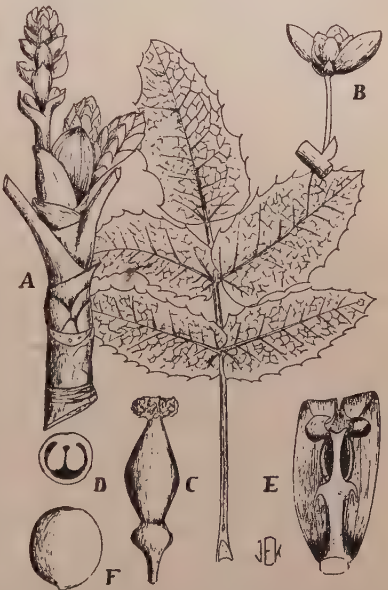

Fig. 22.—*Odostemon Aquifolium* (Pursh) Rydb. Oregon Grape

A, shoot, winter condition, ×1½; leaf about half natural size; *B*, flower, ×1½; *C*, pistil, and *D*, section through same, ×5; *E*, petal and stamen, ×6; *F*, fruit, ×1½.

This species is known from Alberta to British Columbia and south to Nebraska, New Mexico, California. It is common throughout the wooded parts of Montana, at Missoula, Deer Lodge, Helena, Bozeman, West Boulder Creek, Bridger Mountains, and in the Canadian Rockies at Field.

Odostemon aquifolium was first collected by Meriwether Lewis on the memorable expedition to the mouth of the Columbia in 1804–1806, where it was found growing in rich soil on the "Great Rapids of the Columbia" (Cascades) and was called by Lewis' men "Mountain Holly." It was said to be common throughout the wooded regions of the Columbia and was reported by Douglas and others as occurring from the mouth of the Columbia to its source among the mountains in latitude 52° N. and longitude 118° W. The plant has been variously known as *Berberis Aquifolium* Pursh, *Mahonia Aquifolium* Nutt., *Berberis repens* Lindl., *B. nana* and *brevipes* Greene.

2. **Odostemon nervòsus** (Pursh) Rydb.

Larger Oregon Grape

A shrub a foot or two high, from long, subterranean shoots; leaves 1 to 2 feet long, with 11 to 17 ovate acuminate leaflets, which are strongly palmately nerved, the margins serrate with bristle-pointed teeth; bud-scales 1 to 1½ inches long, taper-pointed, persistent, dry and rigid; flowers in clusters of terminal racemes, 6 to 12 inches long; characters of flowers and fruit like the preceding.

This species is distributed from British Columbia to Idaho and California. It is a plant of the forests and is much more restricted in its range and habitat than the preceding, with which it has been more or less confused. It differs from *O. Aquifolium* mainly in the nervation of the leaflets, a feature alluded to in the specific name, but it is also distinct in the matter of the bud scales, which in this case are narrower, persistent, and in the greater number of the leaflets.

Odostemon nervosus was first discovered by Menzies at the mouth of the Columbia, and it has since been reported at many places along the coast but for some time was not supposed to occur east of the humid forests of the seaboard. In later years, however, it has been collected in the Blue Mountains and at other interior points, and may, like many other plants of the coast belt, be found in similar forest conditions which here and there occur in limited areas in the Rocky Mountains.

HYDRANGEÀCEAE

Hydrangea Family

These are shrubs or trees with opposite leaves without stipules. The inflorescence consists of axillary or terminal clusters in the form of cymes or racemes, in some cases the peripheral flowers being sterile and showy, the inner fertile. The fertile flowers are perfect, built usually on the plan of four; the petals and sepals are four each, seldom more, the stamens a multiple of four or indefinite, and the carpels 2 to 10, wholly united or free at the apex. The calyx as a rule is united with the lower half of the ovary and the stamens and petals are inserted upon the calyx at its line of departure from the carpels. The ovary is divided into as many chambers as there are carpels, and the ovules are attached to the axis. The seeds are small and numerous, and generally contain copious endosperm and a small embryo. The fruit is a capsule which opens by splitting downward from the top either into each chamber or between them.

Fifteen or more genera are included in this group, which belongs to temperate and tropical regions. Four genera are listed from the Rocky Mountains, of which but one comes within the region here treated.

By the more conservative authors the family *Hydrangeaceae* is still retained within the *Saxifragaceae,* to which family they are evidently related by the partial union of calyx and ovary and the form and position of carpels and stamens.

The most familiar members of this family are of course the Hydrangeas and Mock Oranges, or Syringas, of the parks and gardens. Among the Saxifrages are some of the most familiar of the spring flowers of our open woodlands.

PHILADÉLPHUS

Mock Orange, Syringa

The plants of this genus are shrubs, diffusely branched, with grayish bark and small winter buds. The leaves are petioled, opposite, simple, and deciduous. The flowers are large, solitary or in axial clusters; the calyx is green, usually 4-lobed, the petals also 4, alternate with the sepals; the numerous stamens are inserted on the disk near the top of the ovary and the base of the sepals. The ovary is largely inferior, divided into 3 to 5 cells and surmounted by as many styles with knob-like stigmas. The capsule is top-shaped, opening by 3 to 5 valves, many-seeded. The seeds are minute, oblong, and with membranous coat.

The number of species of *Philadelphus* is variously reckoned at from thirteen to thirty-five, distributed mainly through the temperate regions of Asia and North America; several of these are found in the Rocky Mountains, especially in middle or southern latitudes.

Numerous forms of *Philadelphus* appear in cultivation, some of which are exotic species, others hybrids or horticultural varieties. *P. coronaria* of Europe is widely planted. These beautiful shrubs are well known for their large, fragrant, usually white flowers. The name Syringa, commonly used for the plants, persists from the sixteenth century, when in Europe it was applied both to this plant and to the Lilac, though the two are in no way related. Scientific nomenclature still preserves to the Lilac this original generic name, while adopting the Linnaean designation of *Philadelphus* for the plants of the Hydrangea group.

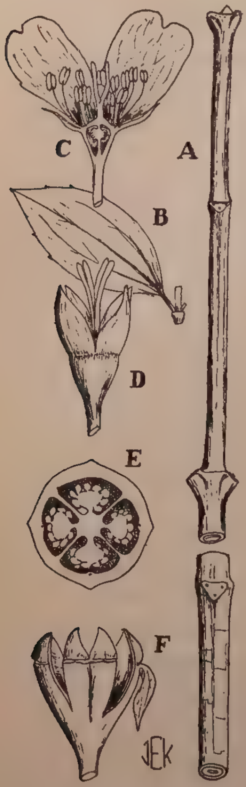

FIG. 23.—*Philadelphus Lewisii* Pursh. Syringa

A, twig and *C,* flower, natural size; *B,* leaf, ×1¼; *D,* flower after the petals have fallen, ×1½; *E,* section through ovary, ×5; *F,* fruit, ×2.

Philadelphus Lewísii Pursh

Syringa. FIG. 23. PLATE 16

A shrub of 6 to 10 feet with many upright and widely spreading slender twigs; bark on older stems gray, slightly rough and soft, on the younger twigs brown or smooth; twigs angled, especially below the leaf-scars, which are cordate or deltoid and covered with white callus on the leading shoots; leaves 1 to 3 inches long, petiolate, broadly lanceolate to ovate, acute at the apex, entire or serrate, smooth or more or less pubescent on both sides; flowers in small cymes at the ends of small branches, or the lower ones solitary or grouped in the axils of the upper leaves; sepals acute, about twice the length of the adherent portion below, petals white, oblong-ovate, ½ to ¾ inch long; stamens unequal, the longer about half as long as the petals; styles about one-fourth as long as the petals, 2- to 4-cleft; fruit a capsule about ¼ inch long, obovate, splitting into 4 valves from the top, the beaks of the valves spreading and the sepals persistent; seeds many, in overlapping arrangement on the placenta. The capsules usually persist on the plants over winter.

This species is common throughout the Northwest, being found from British Columbia to Oregon and east to Montana and Idaho.

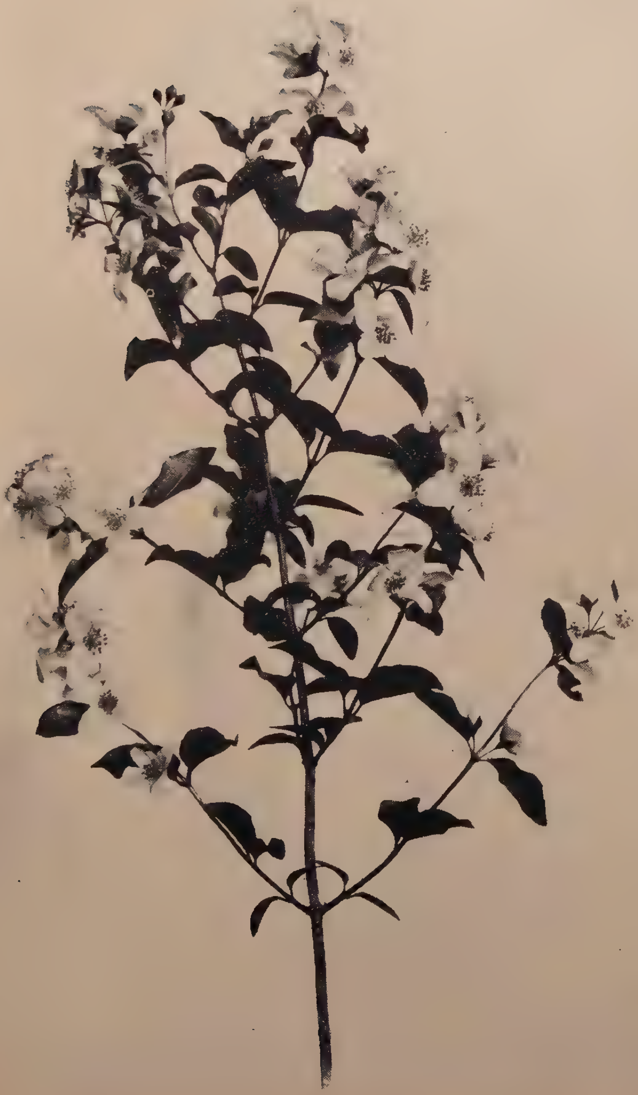

PLATE 16 (p. 130) *Philadelphus Lewisii* Pursh

Syringa, or mock orange, from the vicinity of Missoula, Montana

It is abundant on exposed slopes and in open woods, where its conspicuous burden of white, fragrant flowers in May or June makes it one of the most familiar plants within the region. The plant is named for Meriwether Lewis, by whom it was first collected on Clark's Fork in 1806. It is the state flower of Idaho. In Montana it has been observed in Gallatin and Silver Bow counties, in the Belt Mountains and along the Jocko and Bitterroot rivers, and at Missoula, Helena, and other places.

Another species, *P. Gordonianus* Lindl., is recognized by some authors, who distinguish it from the preceding by the five more or less prominent nerves which arise from the base of the leaf, and the more united styles. This species, described by Lindly in 1838, is said to range from British Columbia to California and Idaho. If it occurs at all in the Rocky Mountains it is probably very rare.

GROSSULARIACEAE

GOOSEBERRY FAMILY

All members of this family are shrubs of medium size, with or without spines and bristles. When spines are present they are single or triple, or more rarely multiple, at the nodes and just below the insertion of the leaves, and vary from short and weak to strong thorns about an inch in length, and are usually straight, extending at right angles to the stem or slightly upward. The bristles when present may vary greatly in size, from about ¼ inch down, slender, sharp, and rigid, or weak and scattered densely over the surface of the twigs, or very few and scattering. The winter buds as a rule are soft, oblong or narrowly ovate, formed of a series of loosely overlapping, papery, brown scales, which remain attached to the twig after the opening of the bud. The fertile buds contain the rudiments of the floral organs for the succeeding season. The leaves are usually borne in fascicles on the ends of very short lateral twigs, which continue in this function for several seasons. While in the bud, the leaves are usually folded like a fan; when mature they are as a rule rotund in outline, with three or more pronounced lobes in palmate fashion, the margin more or less toothed and the petiole long and slender and without stipules. The flowers appear in racemes, which in some members are ample, in others reduced to 2 or 3 flowers emerging from the tufts of leaves on the short spur shoots. The axis of the inflorescence gives rise to slender lateral branches (pedicels), which bear a pair of minute bractlets on opposite sides of the pedicel and on a line at right angles to the radius of the bract. These bracts are often obsolete.

In this group the ovary is inferior, or, in the words of systematic manuals, the calyx is adnate to the ovary; above the ovary extends a tube, which serves as a receptacle for the insertion of sepals, petals, and stamens and which bears on its inner surface a glandular tissue for the secretion of nectar. The tube varies in the different species, in some being hardly more than a ring, in others elongated to form a cylinder in length equaling four or five times its breadth, and again in other cases expanding into a bell- or saucer-shaped structure. The sepals, petals, and stamens are each 5 in number and alternate with one another and are inserted close together near the outer end of the tube. The sepals usually exceed in length the petals and stamens, which often about equal each other in height, or the latter are considerably extended beyond the calyx. The pistil usually rises within the tube to a height about equaling the stamens and bears at its summit two lobes which end in stigmatic surfaces. Two carpels unite to form the pistil, the ovary of which contains an undivided cavity with two opposite vertical rows of ovules. As the ovary matures into the fruit the interior becomes filled with a pulpy tissue in which the seeds become embedded; the fruit is a berry, usually spherical, red or dark purple, smooth or covered with soft bristles.

There are two series in this family which are differentiated by certain characteristics, although there are forms which present steps in some features transitional between the two lines which represent the gooseberries and the currants. In the former the stems are prickly, the pedicels not jointed, and the bractlets if present are situated at the very base of the pedicel and covered by the bract. In the latter case as a rule, the stems are not armed or prickly, the pedicels are jointed beneath the ovary, the bractlets, if present, appearing beneath the joint. The fruit when ripe separates from the plant at the joint in the pedicel. By some authors the former series are grouped under the generic name *Grossularia,* the latter under *Ribes;* by others all are included under *Ribes.* The family was formerly included under the *Saxifragaceae,* to which it apparently stands related by the structure of the pistil and its relation to the receptacle.

In this family there are variously considered to be from fifty to one hundred and fifty species, depending upon the minuteness of detail accepted by different authors as establishing specific distinctions. The range of the group extends around the world in the North Temperate Zone and through the mountains of Central America and the Andes to the Straits of Magellan. In the Rocky Mountains one author cites twenty-eight species, of which sixteen may safely be said to occur within the geographic limits of this treatise.

In their biological features they are plants of varied habits. Some are plants characteristic of swamps and the wet soil of stream bottoms; others are usually found on dry, open slopes. In the Rocky Mountains, where climatic conditions are comparatively dry, most of the species occur among other hardwoods along streams and in canyons, some in the open, others in shaded situations. They multiply vegetatively in some cases by sprouting from the roots, and in others, especially in the more prostrate forms, by striking root where branches touch the ground. In cultivation they are readily propagated by layering after this fashion and by cuttings. The flowers are visited by insects, through the agency of which they are pollinated. To the end that cross-pollination may be effected the stamens often mature before the pistil of the same flower, or vice versa. In some cases both are matured at the same time.

On account of their edible fruits plants of this family are widely planted; the most important are *Ribes vulgare,* the domestic currant, and the European gooseberry, *R. Grossularia,* both natives of Europe. Of these some two hundred to three hundred horticultural varieties are now known. Some of the American species are very showy (*R. sanguineum,* the Scarlet Currant, and *R. aureum,* the Golden Currant) and are widely planted as ornamentals.

Herein this group will be treated as one genus with the characters of the family.

Key to the Species of Ribes

- Twigs armed with spines or bristles
  - Racemes 1- to 4-flowered
    - Spines usually over ½ inch long
      - Sepals white, stamens extending beyond the calyx .... 1. *R. niveum*
      - Sepals green or purplish, stamens shorter than the calyx .... 2. *R. setosum*
    - Spines usually less than ½ inch long
      - Peduncles much longer than the bud scales... 3. *R. irriguum*
      - Peduncles hardly longer than the bud scales... 4. *R. oxyacanthoides*
  - Racemes usually with 6 or more flowers
    - Leaves nearly smooth, fruit black............... 5. *R. lacustre*
    - Leaves pubescent and glandular, fruit red....... 6. *R. montigenum*
- Twigs without spines or bristles
  - Flowers not yellow
    - Tube of the flower wanting
      - Ovary quite smooth
        - Flowers greenish .... 7. *R. vulgare*
        - Flowers tinged with red................. 8. *R. triste*
      - Ovary glandular
        - Petals white .... 9. *R. glandulosum*
        - Petals red .... 10. *R. laxiflorum*
    - Tube of the flower present
      - Flower bell-shaped
        - Flower red .... 11. *R. nevadense*
        - Flowers green or white
          - Racemes drooping .... 12. *R. americanum*
          - Racemes erect or ascending........... 13. *R. hudsonianum*
      - Flower cylindrical
        - Leaves about 2 inches wide................ 14. *R. viscosissimum*
        - Leaves mostly 1 inch wide or less......... 15. *R. cereum*
  - Flowers yellow .... 16. *R. aureum*

1. **Ribes nìveum** Lindl.

A widely branching shrub, 9 feet high or less, brown on the younger twigs, changing to dark gray, short lateral shoots rough with overlapping scales, bristles wanting, nodal spines 1 to 3, stout, brown, ½ to ¾ inch long; leaves numerous, fascicled on short lateral shoots, reaching a width of 2 inches in the largest cases, rounded in outline, blunt at the apex, usually square across the base, but varying from wedge-shaped to cordate, 3- to 5-lobed, each lobe bearing a few blunt teeth, thin, veiny, sparingly hairy above and beneath; petioles slender, longer than the blade, grooved on the upper side, pubescent in the groove; racemes 1- to 4-flowered, arising from the leafy spur shoots, short, smooth, open, and nodding; flowers on slender pedicels each subtended by a small, ovate, papery bract, the flower ½ to ¾ inch

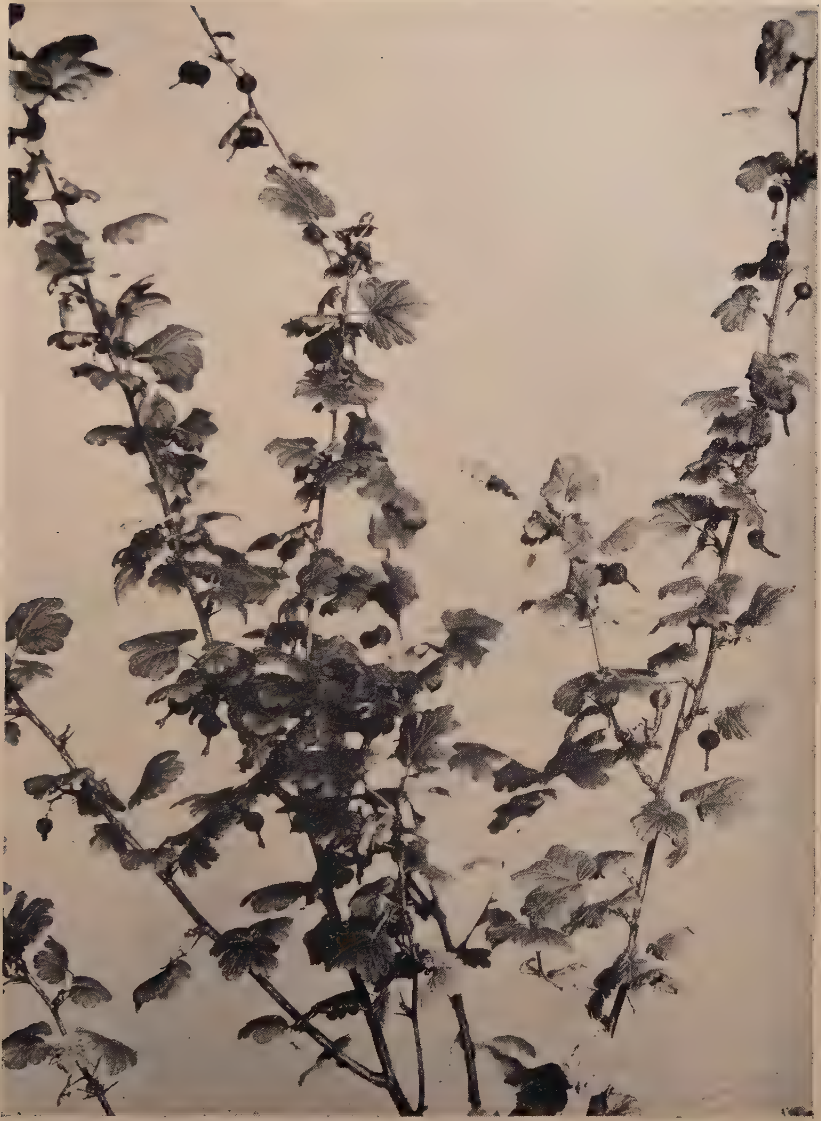

PLATE 17 (p. 135) *Ribes setosum* Lindl.

Missouri gooseberry from the vicinity of Missoula, Montana

long, ovary smooth, oval, hypanthium short, sepals white, narrowly lanceolate or linear, ¼ inch or longer, petals white, about one-fourth as long as the sepals, stamens reaching beyond the sepals, style hairy below; berry globose, smooth, bluish-black, slightly acid, about ⅓ inch in diameter.

The range of *R. niveum* as at present known is comparatively narrow, extending from Idaho and Nevada to eastern Washington. It may be found in the northern Rocky Mountains. It was first discovered in the Northwest by David Douglas and described by Lindly in 1834.

2. Ribes setòsum Lindl.

Missouri Gooseberry. PLATE 17

A shrub, usually less than 3 feet high, with reddish or straw-colored twigs, beset with numerous bristles and strong, straight, triple spines at the nodes; winter buds small, pointed, covered with thin, loosely imbricated scales; leaves usually from ½ inch to an inch in breadth, but on vigorous shoots reaching over 2 inches in width, rounded in outline, the base variously cordate, square or narrowed, divided into 3 principal lobes, the middle one often oblong, the lateral ones again lobed usually into 2 unequal parts, margin coarsely and bluntly toothed, the blade finely hairy on both sides, or later becoming smooth; petioles pubescent, usually shorter than the blades; flowers 1 to 3, on axillary peduncles shorter than the leaves, bracts small, thin, clasping, shorter than the pedicels; flower narrowly bell-shaped, ovary smooth, rarely bristly, tube white, smooth, ¼ inch long or less, sepals white, about half as long as the tube, petals shorter than the sepals, stamens about as long as the petals, anthers blunt, berry red to black, usually smooth, up to ½ inch in diameter.

This is a common species throughout the northern Rocky Mountains and the plains country from Assiniboia and Saskatchewan, to Idaho, Montana, Wyoming, Colorado, the Dakotas, and Nebraska. It has been collected in Yellowstone Park; in Montana, at Missouri, Helena, Great Falls, and Bozeman, and on the Big Hole and Bighorn rivers; in British America, on the Saskatchewan River, Banff, and elsewhere.

Lindly in describing this species states that "the flowers are white, tubular, appearing in pairs and hanging in profusion from the branches, the berries black, hispid, with a subacid, pleasant flavor, a little partaking of musk." He considered it a very ornamental species. It was described in 1830 from plants taken to London from America under the name of the Missouri Gooseberry. Variations from the typical form have been described under the names, *R. saximontanum* E. Nels. and *R. camporum* Blank.

3. **Ribes irrìguum** Dougl.

A shrub 3 to 9 feet high, twigs gray, changing with age to brown, sparingly bristly, bearing at the nodes slender, straight spines usually triple and less than ½ inch in length; leaves small, up to 2 inches broad, thin, 3- to 5-lobed, round in outline, margin with blunt teeth, mostly cordate at the base, smooth above, more or less hairy beneath, petioles as long as the blades or less, hairy and glandular; flowers 1 to 3 on nodding peduncles, which are shorter than the leaves, the ciliate and glandular bracts about as long as the pedicels, flower ¼ to ⅜ inch long, bell-shaped, ovary smooth, tube smooth, green, ⅛ inch long, sepals greenish-white, ⅛ to ⅓ inch long; petals obovate, white, about ½ as long as the sepals; stamens about equaling the petals, style hairy below, berry spherical, smooth, up to ½ inch in diameter.

From Oregon, Washington, and British Columbia to Idaho and Montana this species is said to favor "moist mountain rocks near springs and streams." It was first collected in the Blue Mountains and described by Douglas in 1830, according to whom it was a tall, strong species, sometimes 10 feet high, nearly smooth, except for three small, sharp, ascending prickles below each bud, the fruit with pleasant flavor. Douglas found it on the upper Columbia in British America. It has also been observed in Montana at different places, including Columbia Falls and the Bridger Mountains.

4. **Ribes oxyacanthoìdes** L.

Northern Gooseberry

A shrub usually under 3 feet, with pale green twigs, changing to gray, somewhat shreddy bark on older branches, sparsely or sometimes densely bristly, nodal spines short, sharp, 1 to 3 or multiple; twigs of the last season in winter condition soft velvety pubescent or smooth, brown; buds about ¼ inch long, scales overlapping, thin, loose; leaves up to 2 inches wide, rounded in outline, divided into 3 to 5 lobes, the terminal one largest, lobes somewhat obovate and again divided on the margin into blunt teeth, cordate at the base, or varying sometimes to wedge-shaped, hairy or sometimes smooth, especially at maturity; petioles more hairy than the blades and somewhat glandular, about as long as the blades; peduncles arising from the ends of short spur shoots among the leaf bases, short, 1- to 2-flowered, nodding, bracts minute, leaf-like, much shorter than the pedicels; flowers ⅓ inch long, ovary smooth, tube somewhat oval, smooth, greenish-white, sepals white, smooth, ⅛ inch long, more or less, petals obovate, white, shorter than the sepals, stamens about as long as the petals; berry globose, smooth, about ⅜ inch in diameter.

The Northern Gooseberry is found from Hudson Bay to the Yukon, British Columbia, California, Montana, North Dakota, and Michigan. It is found also in Yellowstone Park and in Montana at Baker, Missoula, Clinton, the Lolo Valley, and Bridger Mountains. It is one of the most common species throughout Canada.

This gooseberry is very similar to *R. irriguum* and by some authors is considered the same; it is separated from that species by its more bristly stems and shorter peduncles. Probably much of the material labeled *R. oxyacanthoides* in herbaria is *R. irriguum.*

5. **Ribes lacùstre** (Pers.) Poir.

Swamp Currant

A shrub 3 to 4 feet high, spreading, with many crooked branches, twigs pubescent with short hairs, those of the current season pale brown, those of a year old darker, becoming gray on older twigs, buds small, soft, light brown, with thin scales, smooth in some cases, in others bristly, bearing short triple spines at the nodes; leaves reaching 2 inches in length and breadth, acute or obtuse at the apex, cordate at the base, rounded in outline, thin, usually 5-lobed, lobes ovate, the middle largest, usually smooth on both sides, dark green above, paler beneath; petioles slender, as long as the blades, hairy and glandular; racemes axillary, bearing 5 to 12 flowers, each on a pedicel about as long as the flower, subtended by a thin, oblong bract, the whole inflorescence bearing numerous stalked glands which are most conspicuous on the ovary; flower about ¼ inch long, bell-shaped, tube bowl-shaped, sepals broad, spreading, tinged with red, petals smaller than the sepals, red-veined, narrowed at the base; stamens short; berry ¼ inch or more in diameter, deep purple, covered with glandular bristles.

A northern transcontinental species with a range from Newfoundland to Alaska, and south to Pennsylvania, Michigan, Utah, and California. It is especially abundant in wet woods and is found throughout Canada to Fort Franklin and Bear Lake near the Arctic Circle, and reported from Lake Louise, Lake Agnes, Field, and Twin Valleys. Southward it is common also in Yellowstone Park and in Montana about Flathead Lake, Missoula, Lolo, Jefferson City, the Little Rockies, Belt Mountains, and Priest Pass.

David Douglas described *Ribes echinatum,* which he considered closely related to *R. lacustre* but distinct owing to longer and stronger prickles and less divided leaves and the fact that it never frequents wet ground as does *R. lacustre.* He states also that the calyx is black-rimmed, a feature which Hooker denied. The conspicuous variability of the armament, however, places the distinction on very unstable ground and the majority of opinion at present considers *R. echinatum* Dougl., *R. grossularoides* Michx., and *R. parvulum* Rydb. as mere forms of *R. lacustre.*

6. **Ribes montìgenum** McClatchie

Mountain Gooseberry

A shrub 1 to 4 feet high, widely branched, twigs medium brown in color, turning to a gray or silvery, somewhat shredded bark on older stems, the branches bristly, sometimes thickly so, bearing stout, short, triple or multiple spines at the nodes; leaves ½ to 1½ inches wide, rounded in outline, acute or obtuse at the apex, cordate at the base, deeply parted or cleft into 5 lobes, the middle one distinctly narrowed toward the base, the margin furnished with numerous rather sharp teeth, more or less densely hairy above and beneath and somewhat glandular; petioles also hairy, mostly shorter than the blades; racemes short, few-flowered, glandular-pubescent, the pedicels very short and the bracts nearly as long as the pedicels; flowers ⅛ inch long, or slightly more, bell-shaped, ovary glandular, tube spreading into a bowl-like form, sepals broad, veiny; berries red, glandular bristly, up to ¼ inch in diameter, containing 1 to 3 large seeds.

This species is native to the high mountains and arid regions from California, Arizona, and New Mexico northward to British Columbia and Montana. It was first collected on the summit of San Jacinto Mountain in California, at 10,000 feet altitude, and described by McClatchie in 1894 as *R. nubigenum,* but later changed to *R. montigenum.* It seems to be the same as *R. molle* Howell and *R. lentum* Cov. and Rose.

7. **Ribes vulgàre** Lam.

Common Currant

A shrub 3 to 5 feet high, without spines or bristles, the young twigs pale, the older dark brown, more or less hairy when young, leaf-scars narrow, inconspicuous; buds small; leaves 2 inches more or less in width, rounded in outline, 3- to 5-lobed, apex acute, base cordate, lobes shallowly dentate, upper surface of the blade mostly smooth, the lower more or less pubescent, distinctly veined; petioles often as long as the blades or longer; racemes drooping, many-flowered, slightly hairy, pedicels slender, much longer than the ovate bracts; flowers bell-shaped, green or slightly purple, ovary smooth, sepals green, obtuse, spreading; petals yellowish-green; berry red, shining, ⅜ inch in diameter or less.

This is the common domestic currant, which has escaped from cultivation in many places and has been found growing wild here and there across the continent from Ontario and Massachusetts to Wisconsin, Montana, Oregon, and British Columbia. Collected at Missoula.

8. **Ribes tríste** Pall.

A shrub 3 feet or less in height, the stems ascending or prostrate, shoots of the season usually pubescent and with some glandular hairs, twigs smooth, gray, bark shredding, older branches smooth, chestnut-brown, leaf-scars rather prominent, reaching nearly halfway around the twig; buds less than ¼ inch long, soft, with loose scales; leaves 2 to 4 inches wide, reniform or rounded in outline, acute or obtuse at the apex, the base cordate, margined with blunt teeth, the blade usually descending somewhat along the petiole, usually obviously hairy beneath; petiole mostly shorter than the blade, more or less pubescent, somewhat glandular toward the base; racemes several-flowered, more or less glandular, pedicels ¼ to ⅜ inch long, the bracts ovate, much shorter than the pedicels; flowers more or less strongly tinged with red, less than ¼ inch long, bell-shaped, ovary smooth, tube and sepals spreading, the latter obtuse, petals and stamens about half the length of the sepals; berry smooth, red, about ¼ inch in diameter.

The range of this species extends across the continent and into northern Asia. In North America it reaches south to New Jersey, Michigan, South Dakota, and Oregon.

The species was first described in 1797, but has since been known under various names, as *R. rubrum* Gray, *R. ciliosum* Howell, and *R. migratorium* Suks.

9. **Ribes glandulòsum** Grauer

Fetid Currant

A shrub under 3 feet, decumbent or spreading, without bristles or spines, shoots of the season smooth, those of the previous season pale gray, the surface film gradually shredding off to expose a dark brown bark of the older stems, leaf-scars narrow; buds small; leaves thin, fetid, 1 to 3 inches wide, rounded in outline, acute at the apex, cordate at the base, 3- to 5-lobed, deeply and often doubly serrate or dentate, smooth above, slightly pubescent on the veins beneath; petioles slender, about as long as the blades, usually glandular ciliate at the base; racemes ascending, 2 to 3 inches long, the main axis and pedicels minutely hairy and glandular, bracts linear, glandular; flowers ⅛ to ¼ inch long, the ovary distinctly glandular, sepals white, oblong, veiny, the petals white, rhombic or spatulate, with broad claw, about ½ as long as the sepals, stamens about equaling the petals; berry red, glandular bristly, ¼ inch or more in diameter.

The Fetid Currant has a wide distribution northward through the British possessions from Newfoundland to Mackenzie, British Columbia, Athabasca, Saskatchewan, and Manitoba. Within the United States it has thus far been reported near the Great Lakes and along the mountains as far south as North Carolina.

It was first collected in Labrador and described by Grauer in 1784. Also known as *R. prostratum* L'Her.

10. **Ribes laxiflòrum** Pursh

A decumbent shrub without spines or bristles; shoots of the season finely pubescent, those of the previous season gray, usually striate, older branches becoming darker gray or brown, leaf-scars narrow, reaching about halfway around the twig; buds comparatively large, ¼ to ½ inch long, scales loosely overlapping, enlarging with the opening of the bud and persisting as thin, brown appendages at the bases of the leaves and peduncles; leaves 1 to 4 inches wide, orbicular in outline, acute at the apex, cordate at the base, sharply 5-lobed, distinctly serrate or dentate, smooth above, somewhat hairy beneath, especially when young; petioles about as long as the blades, pubescent, glandular, especially at the base; racemes erect, spreading, 6- to 12-flowered, hairy and glandular, pedicels short, or sometimes growing to ½ inch in length, bracts narrow, much shorter than the pedicels; flowers ¼ inch long or less, ovary pubescent, glandular; calyx spreading, about ¼ inch across, hairy, sepals spatulate, obtuse, about ⅛ inch long; petals fan-shaped, red, less than half as long as the sepals; stamens short; berry red or dark purple, hairy, with a bloom.

The range of *Ribes laxiflorum* extends from eastern Asia through Alaska and the coast region to California and eastward to the northern Rocky Mountains in Alberta, Idaho, and probably Montana. It was first collected by Menzies on the northwest coast and described by Pursh in 1814. It has also been known as *R. americanum* Pall. and *R. affine* Dougl.

11. **Ribes nevadénse** Kellogg

Nevada Currant

A shrub with ascending branches, shoots of the season finely hairy or smooth, those of the previous year a lustrous brown, changing to dark gray on the older branches, from which the bark shreds off in layers, marked by faint leaf-scars; leaves 1 to 3 inches wide, usually broader than long, obtuse at the apex, cordate to square across the base, mostly 3-lobed, obscurely 5-lobed, lobes usually rounded, margin irregularly crenate-dentate, more or less hairy and glandular; petioles slender, about as long as the blades, glandular, hairy and ciliate at the base; racemes nodding or ascending, about as long as the leaves; flowers crowded toward the end, axis, pedicels, and bracts glandular, bracts large, exceeding the pedicels, oblong, thin; flowers rose-colored, ⅜ inch long, nearly cylindrical, ovary glandular, tube short, sepals longer, petals white, orbicular to oblong, shorter than the sepals; stamens about as long as the petals; style smooth; berry blue, with a bloom, nearly globular, sparingly glandular, about ⅓ inch in diameter.

The Nevada Currant is distributed from Oregon to California and east to Nevada, Idaho, and Montana. A rare species of the mountain woods. Reported from Granite, Montana.

This plant was first brought to notice in 1855. It appears to be the same as *R. ascendens* Eastw. and *R. Grantii* Heller.

12. **Ribes americànum** Mill

Black Currant

A shrub 3 to 6 feet high, without spines or bristles, branches often angled, the shoots of the season pubescent and glandular, those of the previous season gray, gradually changing to darker gray and brown on older branches, leaf-scars narrow; buds usually less than ¼ inch long; leaves broad, orbicular, or some of the uppermost ovate, obtuse or acute at the apex, cordate, rounded or square across the base, margin serrate or dentate, smooth above when mature, hairy beneath, at least on the veins, and glandular; petioles hairy, often long-ciliate toward the base; racemes nodding, all parts of the flowers distinctly hairy, bracts oblong or lanceolate, longer than the pedicels; flower bell-shaped, ¼ to ¾ inch long, ovary smooth, tube greenish-white, nearly cylindrical, scarcely hairy, ⅛ inch long, sepals nearly white, slightly pubescent, oblong, rounded at the apex; petals ⅔ as long as the sepals and the same color; stamens as long as the petals; fruit black, smooth, ¼ to ⅜ inch in diameter.

This species is found from Nova Scotia to Assiniboia and Alberta and south to Nebraska and through the Rocky Mountains to New Mexico. It has been collected at many places, including Yellowstone Park, and in Montana at Fort Missoula, Lolo Valley, Silver Bow County, Red Lodge, Elliston, and West Gallatin.

Ribes americanum was one of the first American members of this genus to be brought to notice; it was described by Miller in 1768. It has received other names in subsequent years, probably the most familiar of which is *R. floridum* L'Her.

13. **Ribes hudsoniànum** Richards

Hudson Bay Currant. PLATE 18

A shrub 3 to 6 feet high with ascending or procumbent branches, spreading in open places wider than its height, branches more or less angled, without spines or bristles, shoots of the season mostly smooth, green, resin-dotted, the young twigs pale gray with shredding bark, the older ones darker gray or brown, leaf-scars extending halfway around the twig; buds ¼ inch long, on short stalks, soft, covered by thin, loosely overlapping scales; leaves 1 to 4 inches broad, broader than long, distinctly 3-lobed, the lateral lobes obscurely or irregularly again divided into 2 each, the lower much smaller, the apex usually sharp, the base cordate or square, margin closely and sharply dentate or serrate, more or less pubescent, especially when young, resinous-dotted beneath; petioles longer than the blades, nearly smooth; racemes more or less erect, 1 to 4 inches long, bracts variable but often long-pointed, thickly clothed with white hairs; flowers less than ¼ inch long, open bell-shaped, ovary hairless but resin-dotted, tube short or wanting, sepals white, oval, blunt, spreading, densely hairy; petals white, less than half as long as the sepals; stamens short, not exserted; berry globular, black, ¼ inch, or more or less, in diameter.

This shrub is widely distributed throughout the northwestern part of North America, being found from Hudson Bay to Alaska and south to Minnesota, Montana, Idaho, Wyoming, British Columbia, and Washington. It is found through the Canadian Rockies (Banff, Donald) and is very common along streams in western Montana. It

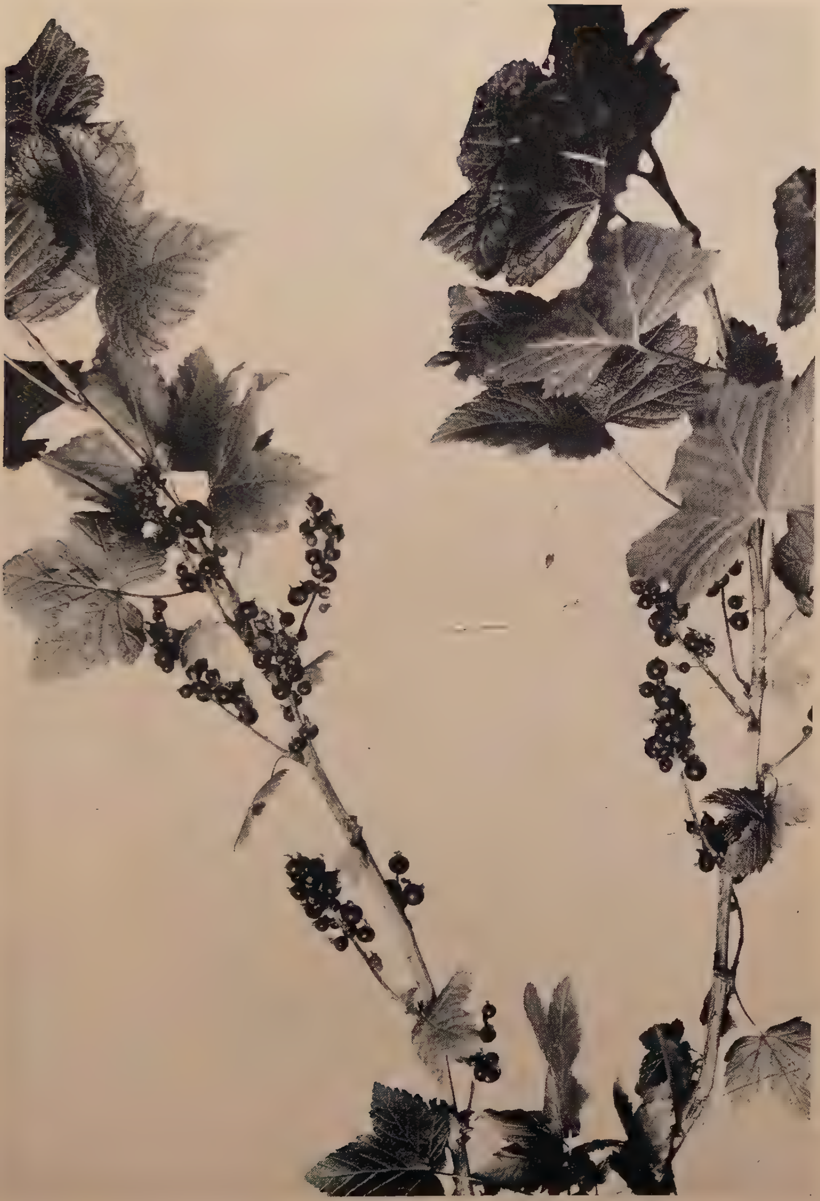

PLATE 18 (p. 142) *Ribes hudsonianum* Richards

Hudson Bay currant. Leaves and fruit in August, from Missoula, Montana

has been collected in Lolo and Grant Creek valleys near Missoula and at Deer Lodge, Spanish Basin, and Priest Pass; in Idaho, reported from Mackay and Silver City.

The description of this species dates from 1824. Another form, described by Douglas as *Ribes petiolare,* is cited by some authors as a synonym, by others as a distinct species, on the basis of less pubescence and deeper basal sinus of the leaf, larger racemes and shorter bracts, all of which differences in characters can be found on the same plant; nor are the variations appreciably co-ordinated. It was taken to England in 1827 by Douglas, who considered it similar to but distinct from *R. hudsonianum.*

14. **Ribes viscosíssimum** Pursh

Viscid Currant

A shrub, 3 to 4 feet high, branches without spines or bristles, ascending shoots of the season, sparingly or thinly hairy, those of the season before gray, still pubescent, older twigs dark gray or brown, the bark peeling off in thin layers, leaf-scars small; leaves 1 to 3 inches wide, reniform to orbicular in outline, 3-lobed, or in some cases faintly 5-lobed, the lobes all rounded, apex obtuse, base cordate, margin crenate-dentate, pubescent and glandular on both sides; petioles mostly shorter than the blades, densely hairy and glandular and long-ciliate toward the base; racemes few-flowered, spreading or ascending, all parts hairy and glandular, bracts large, obovate, thin; flowers nearly ¾ inch long, almost cylindrical, ovary glandular, tube about ¼ inch long, greenish, sepals about as long, spatulate, rounded at the apex, white, tinged with pink; berry black, without bloom, somewhat glandular bristly, sometimes nearly ½ inch in diameter.

This plant is found from Montana to British Columbia and California and south to Colorado. It is found in Yellowstone Park and in Montana at Missoula, Marysville, East Fork of the Bitterroot River, and in the Bridger Mountains. It is reported common in the Canadian Rockies.

The original collection of the species was made by Meriwether Lewis along the Columbia River. Douglas spoke of it as a bush 6 to 8 feet high, and as having nauseating fruit.

15. **Ribes cèreum** Dougl.

Squaw Currant. Fig. 24

A shrub, 3 to 6 feet high, without spines or bristles, widely and irregularly branched, shoots of the season covered with short pubescence, those of the previous season still pubescent except where the thin gray superficial layer scales off to expose the clear brown layer beneath, older branches dark gray or brown, smooth, leaf-scars faint; buds plump, sharp, oval, with few exposed scales, terminal on the ends of short perennial spurs; leaves usually less than 1 inch wide, kidney-shaped or rounded in outline, with rounded apex and cordate or square-cut base, as a rule shallowly 3-lobed, the lobes rounded, crenate-dentate on the margin, sparingly hairy and glandular or finally becoming smooth on both sides, the petiole usually hairy and shorter than the blades; racemes few-flowered, more or less hairy throughout, the bracts much longer than the pedicels, usually more or less lobed above; flowers pink or greenish-white, nearly cylindrical, about ½ inch long, four to five times as long as broad, ovary glandular, tube ¼ inch or more long, pubescent, the sepals ovate, petals minute, nearly orbicular; stamens very short; berry red, about ¼ inch in diameter.

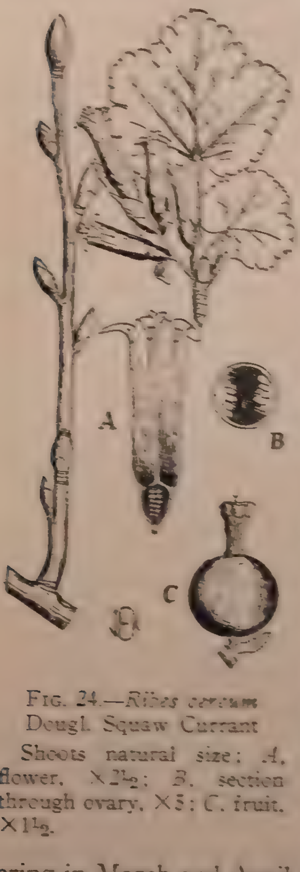

FIG. 24.—*Ribes cereum* Dougl. Squaw Currant

Shoots natural size; *A*, flower, ×2½; *B*, section through ovary, ×5; *C*, fruit, ×1½.

The distribution of *Ribes cereum* is along the coast from California to British Columbia and east to the Rocky Mountains from Arizona and New Mexico to Montana and the Canadian Rockies. It is found in Yellowstone Park and in Montana at Missoula, Glendive, Great Falls, and Spanish Basin; in Idaho, at Silver City; and in the British possessions, on the Fraser River.

Douglas found this species growing on dry rocks along the Columbia River from The Dalles to the Rocky Mountains, flowering in March and April and ripening its fruits in June. In western Montana it is one of the most common plants in the shrubby vegetation of dry foothill slopes, but is not confined to such situations.

Some uncertainty obtains as to the scope of the concept of *Ribes cereum* Dougl. Some forms at present recognized as distinct species are by others included under this designation; such are *R. reniforme* Nutt. and *R. inebrians* Lindl. The former is separated mainly on the degree of pubescence in different parts, being considered smoother, and in the form of the bracts of the inflorescence, which in *R. cereum* are cut or lobed at the apex but in the other nearly or quite entire. On the other hand, *R. inebrians* has fewer distinguishing marks but exhibits those features which are frequently found in plants growing at high altitudes and in situations difficult by reason of unfavorable soil or exposure to unusual winds, viz., a depressed and stunted form, smaller and thicker leaves, increased pubescence, etc.

16. **Ribes aùreum** Pursh

Golden Currant

A shrub 6 feet or more in height, with slender, ascending or erect branches, shoots of the season usually covered with a minute pubescence, traces of which may persist for a year or more, older twigs gradually becoming gray or darker, leaf-scars narrow, reaching less than halfway around the twig; buds small; leaves ¾ to 2 inches wide, variously lobed, but usually into 3 main divisions, which are directed forward, apex usually obtuse, base rounded or wedge-shaped, the lobes often entire or sparingly toothed, hairs seldom on either side of the blade at maturity; petioles usually shorter than the blades; racemes 5- to 15-flowered, 2 to 3 inches long, bracts oblong or lanceolate, usually exceeding the pedicels; flowers sometimes reaching ¾ of an inch, yellow, ovary smooth, tube cylindrical, ⅜ inch long, sepals ¼ inch or less, oblong, rounded, spreading; petals small, oblong, with irregular edge; berry globose, red, black, or yellow, ¼ inch in diameter.

This species is found from Washington to California and east to Assiniboia, the Black Hills, New Mexico, and Arizona. It is found in Montana at Missoula, Great Falls, Bozeman, and Boulder River, and in the Canadian Rockies on the West Fork of the Milk River.

The plant was collected on the banks of the Columbia and Missouri rivers by Lewis and Clark, and since its original description by Pursh has been variously named. Another form of the plant, known as *R. longiflorum* Nutt., is by some viewed as a distinct species, native to the lower plains country from South Dakota to Texas.

ROSACEAE

Rose Family

The Rose Family embraces a large assemblage of plants having wide diversity in form, structure, and habit. It formerly included the Apple and Plum families, which by most recent authors are now treated as distinct groups. The *Rosaceae* in the narrower sense include herbs, shrubs, and trees with alternate simple or compound leaves, in most cases with evident stipules. The flowers are in clusters, seldom solitary, and have both stamens and pistils in the same blossom. Each flower has five sepals and five petals, although there are exceptional cases in which the petals are lacking, the petals alternating with the sepals in arrangement and the latter overlapping one another in the bud. The stamens are usually numerous and often indefinite in number, the two-celled anthers opening lengthwise. The carpels are few or many, often distinct or separate from one another, at least in part, and are inserted upon a receptacle which is either convex or concave and upon the edge of which are arranged the stamens, petals, and sepals. Between the stamens and pistils a space usually occurs which is occupied by glandular tissue, which functions in nectarial secretion in the interest of insect visitation. Two ovules are usually borne in each cell of the ovary, though in fruit but one of these may mature. When the receptacle is concave it is frequently joined to the sides of the carpels, so that the ovary appears to be inferior, i.e., appears externally below the insertion of sepals. The fruit ripens as small, dry or succulent, one-seeded carpels, either detached from one another or aggregated.

The Rose Family comprises sixty-five or more genera and over twelve hundred species, distributed over the whole earth. They are found from the tropics to the polar regions and from sea-level to the snow-line on the high mountains. Less conservative views place the number of genera in this family in the Rocky Mountain flora at thirty-six and the species at two hundred and thirty-eight, of which eleven genera and about forty-seven woody species are assigned to the northern ranges and valleys. Members of this family are among the most common elements in the existing flora and are plentifully represented in the fossils of the Tertiary and other periods.

In their biological characteristics the plants of the Rose Family have points of interest in connection with the flower and fruit structure. Cross-pollination is effected through the visits of insects, which are induced by the nectar secreted by the ample glandular tissue of the flowers, which are also usually showy and often fragrant. The corolla is usually white, yellow, or red, often large where the flower is solitary, or small where numerous flowers are aggregated into conspicuous clusters. The nectariferous tissue is seldom enclosed in a pocket or deep tube or other special floral device but is exposed where it is accessible to insects of many different kinds. Within this family a considerable range of floral structure is evident, showing transitional forms especially in the relation of the receptacle to the carpels, which vary from one extreme of entire freedom to the other of complete fusion. The fruit ripens in a great variety of forms; some by the development of plumose appendages are fitted for wind dispersal, others by reason of hooks and barbs cling readily to many objects brought into contact with them, and still others become succulent and edible, hence attractive and eagerly sought by many birds and mammals.

Plants of the Rose Family are widely used for various purposes. Some yield essential oils and are valued for their medicinal qualities, others bear fruits which even in the wild state are of some value but under cultivation yield some of the choicest horticultural products. Many species have yielded to the skillful treatment of the horticulturist, who has produced a multitude of garden varieties of great beauty.

KEY TO THE GENERA

- Leaves simple, or at most deeply lobed
  - Plants low, cushion-like or creeping
    - Flowers solitary, sessile among the leaves........ *Kelseya*
    - Flowers in elevated clusters
      - Leaves lobed .... *Luetkea*
      - Leaves entire .... *Petrophyton*
  - Plants erect, branching
    - Leaves not palmately veined
      - Leaves ovate, without stipules
        - Leaves sharply serrate.................. *Spiraea*
        - Leaves bluntly toothed.................. *Holodiscus*
      - Leaves narrow, with stipules
        - Shrub, leaves wedge-shaped............. *Purshia*
        - Small tree, leaves elliptical.............. *Cercocarpus*
    - Leaves palmately veined
      - Leaves mostly under 2 inches broad.......... *Opulaster*
      - Leaves mostly over 4 inches broad........... *Bossekia*

Leaves compound
  Stems without spines or prickles
    Segments of leaves many, minute............... *Chamaebatiaria*
    Segments of leaves few, larger................. *Potentilla*
  Stems usually with spines or prickles
    Receptacle not fleshy in fruit.................. *Rubus*
    Receptacle fleshy in fruit...................... *Rosa*

KELSÈYA

This genus as at present known is represented by low, matted or cushion-like woody plants with tufted stems and short branches covered with small scale-like leaves. The leaves are entire, crowded, leathery, and persistent, and overlapping along the whole length of the branches. Solitary flowers appear at the ends of the branchlets, concealed within the clump, and often appearing lateral by the elongation of a side shoot; the receptacle is short, bowl-shaped, shorter than the five lobes of the calyx which surmount it; the petals are twice as long as the sepals and alternate with them, narrow and spatulate. The stamens are about 10 in number, their slender filaments about as long as the petals. The pistils usually are five, with terminal styles and minute stigmas, the ovary bearing 3 to 4 ovules suspended from the upper part of the chamber on the side toward the floral axis. The fruit is a small pod with leathery walls, opening along both the inner and outer margins and producing a few narrow seeds with pointed ends.

The genus *Kelseya* contains but a single species as appears at present, sparingly distributed in the northern Rocky Mountains. The generic description was written by Rydberg in 1900, separating this plant from *Eriogynia,* which by earlier authors was included under *Spiraea,* to which it apparently stands related in characters of flower and fruit, though totally different in appearance.

Kelseya uniflòra (S. Wats.) Rydb.

FIG. 25

A small plant characterized by rounded cushions 2 to 3 inches high, formed by the many crowded branches; leaves minute, overlapping like scales, and covered with a fine silky pubescence; flowers very small, the petals white, spatulate, about ⅛ inch long.

This interesting plant was discovered in 1888 by Rev. F. D. Kelsey, in honor of whom the genus was named. It was found "high up on precipitous cliffs overhanging the Missouri River at the 'Gate of the Mountains' near Townsend, Montana." As at present known its range is confined to Montana, Idaho, and Wyoming.

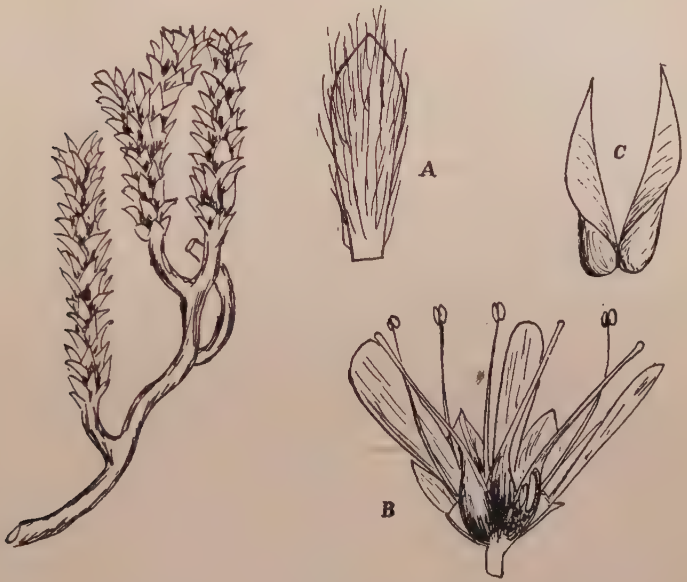

FIG. 25.—*Kelseya uniflora* (S. Wats.) Rydb.
Shoot about natural size; *A*, leaf and *B*, flower, ×10; *C*, open follicle. After Watson.

LUÈTKEA

Low plants creeping by woody runners, the stems bunched in masses, erect, and leafy. The leaves are rigid, twice or thrice divided, the divisions narrow and sharp-pointed, grooved on the upper side. The flowers are borne in cylindrical clusters at the tops of leafy stems. The receptacle of the flower is hemispheric, bearing on its margin 5 broad, pointed sepals, which fit together in the bud like valves. Five broad petals alternate with the sepals, and stamens to the number of about 20, with slender filaments, occupy a ring within the petals. Below the insertion of the stamens the concave bowl of the receptacle descends to the insertion of about 5 pistils, which occupy the center of the flower. Each pistil has a narrow ovary with 2 to 3 pendulous ovules in the angle toward the axis of the flower and a slender terminal style ending in a small stigma. The small leathery pods open along both the inner and outer sutures and release a few seeds narrow and pointed at both ends.

But one species is at present described under this genus, the distribution of which seems to extend from the coast of Alaska to California and east to the Canadian Rockies. The genus was first described by Bongard in 1832, who described this plant from a collection made at Sitka. Menzies found it at Bering Straits and Drummond reports it from the "Height of Land" near the source of the Columbia River. Hooker in 1832 described it as *Eriogynia,* but Pursh seems to have been the first to bring it to notice, referring it to the Saxifrage Family under *Saxifraga.*

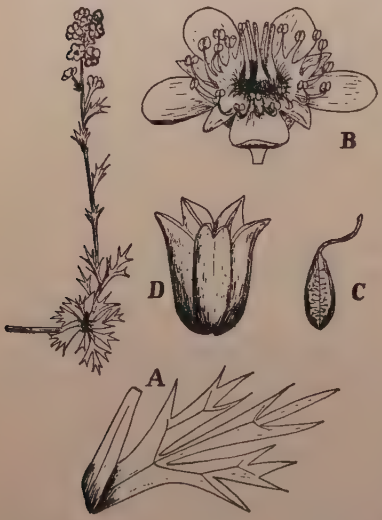

FIG. 26.—*Luetkea pectinata* (Pursh) Kuntze

Shoot about one-half natural size; *A,* leaf, ×3; *B,* flower, ×5; *C,* pistil, ×10; *D,* fruit. After Hooker.

Luetkea pectinàta

(Pursh) Kuntze

FIG. 26

A low shrub, the leafy parts scarcely more than 2 to 3 inches high, the flowering shoots rising to 5 to 6 inches; leaves about ½ to ¾ inch long, smooth, crowded along the slender ascending stems, reduced upward along the scape to some entire bracts in the inflorescence; racemes 1 to 2 inches long, rather open below; flowers about ¼ inch broad, the petals about ⅛ inch long, white; sepals ovate, acute, smooth; pods ⅛ to ¼ inch long, shining, in age nearly smooth.

This plant was first described by Pursh in 1814 as *Saxifraga pectinata.* Later Hooker (1832) named it *Eriogynia pectinata,* and Torrey and Gray in 1840, *Spiraea pectinata.* The present name was applied by Kuntze in 1891. It is distributed from Alaska to Oregon and Alberta; at Glacier and on summits of the Selkirks.

PETRÓPHYTON

The plants of this genus are densely bunched and low, growing on rocks and creeping by more or less woody runners. The leaves are fascicled in rosettes at the ends of short laterals, entire, evergreen, leathery, oblanceolate. The cylindrical inflorescence is usually borne at the top of a slender scape, with sometimes a few smaller ones on lateral branches. The receptacle is cup-shaped or hemispheric, bearing on its margin 5 pointed sepals, which are in contact with one another by their margins in the bud. Five petals alternate with the sepals, and within these about 20 stamens form an inner circle, their filaments slender and distinct, about twice as long as the sepals. The center of the flower is occupied by 3 to 5 pistils, the ovaries of which are topped by slender styles terminating in small stigmas. Two or three ovules are attached to the upper inner surface, toward the center of the flower. The small leathery pods open along both sutures to release the small linear seeds.

The genus *Petrophyton* belongs to western North America from the Rocky Mountains to the Pacific Coast. About five species are at present recognized, of which one occupies the northern Rocky Mountains.

Originally Nuttall (1840) described this plant as a *Spiraea,* but Watson later placed it in his subgenus *Petrophyton,* under *Eriogynia.* Its establishment as a genus, *Petrophyton,* dates from Rydberg's *Flora of Montana and the Yellowstone National Park,* published in 1900.

Petrophyton caespitòsum (Nutt.) Rydb.

Fig. 27

A low, creeping shrub, the matted stems forming large flat cushions on the rocks, the stems entirely concealed by the thick thatch of small leaves, hardly rising from the surface on which they grow, except the almost naked flowering shoots, which reach a height of 4 to 8 inches; inflorescence compact, hairy on axis, pedicels, and calyx, 1 to 2 inches long, the flowers very small, about ⅛ inch broad; sepals ovate, lanceolate, sharp-pointed, petals spatulate, obtuse; pods 3 to 5, about 1/12 inch long.

This species is found throughout the Rocky Mountains from Montana to New Mexico, east to the Black Hills, and west to California. In Montana it has been found mostly in the southern part of the state in Gallatin and Madison counties. It was first discovered by Nuttall "on high shelving rocks in the Rocky Mountains toward the sources of the Platte."

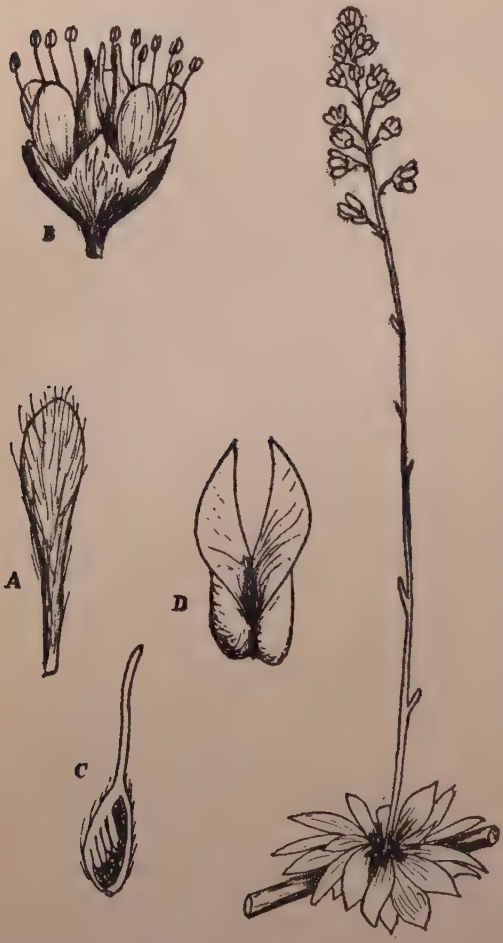

Fig. 27.—*Petrophyton caespitosum* (Nutt.) Rydb. Shoot about natural size; *A*, leaf, ×4; *B*, flower, ×7; *C*, pistil, ×10; *D*, follicle, ×12. After Watson.

SPIRAÈA

These are low shrubs with simple alternate leaves which diminish upward to mere bracts in the inflorescence, without stipules. They bear small, white or rose-colored flowers, usually in compact, terminal clusters. The flowers are usually perfect, but may have only stamens or pistils. The calyx is normally 5-lobed, sometimes

4-lobed, persistent; and the petals are of the same number, alternating with the sepals, attached to the calyx by a narrow, claw-like base. Numerous stamens are inserted with the petals on the receptacle, their filaments slender. Within the circle of stamens the receptacle is lined with a glandular disk, the margin of which bears 10 small lobes, two to each petal. Usually 5 carpels or pistils occupy the center of the flower and stand alternate with the sepals, sessile but not joined to the calyx, each composed of a 1-celled ovary which tapers upward into a style slightly dilated at the top, which is covered with stigmatic papillae. In the internal angle of the ovary is a double vertical placenta, bearing several horizontal or obliquely ascending ovules. The fruit, formed by the ripening carpels, consists of small pods or follicles, not inflated, which open along the inner suture. The seeds are linear, pendulous, with a dull testa, and without endosperm.

The number of species of *Spiraea* is variously considered as from forty to seventy. They are natives of the North Temperate Zone, extending south in America to Mexico and in Asia to the Himalayas. Many species formerly included under *Spiraea* are now referred to other genera (*Opulaster, Holodiscus, Chamaebatiaria,* etc.). By some authors five species are assigned to the northern Rocky Mountains. There are some fossil forms.

Many horticultural varieties and introduced species of *Spiraea* are known to gardeners and are widely planted throughout the country.

KEY TO THE SPECIES OF SPIRAEA

- Flowers white .... 1. *S. lucida*
- Flowers red
  - Leaves smooth
    - Leaves mostly less than 1 inch long.................. 2. *S. densiflora*
    - Leaves more than 1 inch long......................... 3. *S. Menziesii*
  - Leaves hairy beneath.................................. 4. *S. Douglasii*

1. **Spiraea lùcida** Dougl.

Birch-leaved Spiraea. FIG. 28

A low shrub, usually less than 2 feet high, with creeping rootstock and erect branches, the younger shoots sometimes dying back in the winter, the twigs straight, slender, smooth, and light brown, the older of a darker color by the exfoliation of the superficial cells; leaves from ¾ to 3 inches long, ½ to 2 inches wide, ovate or oval, the apex sharp- or blunt-pointed or rounded, the base usually rounded, sometimes broadly angled or unequal, the margin quite variable, from nearly entire to rather deeply cut and deeply serrate with taper-pointed teeth, thin, entirely smooth, somewhat shining above, paler beneath; petioles short; stipules none; inflorescence broadly convex, 1 to 3 or even 4 inches across, compact, the individual flowers ⅛ to ¼ inch broad, the receptacle (tube or hypanthium) hemispheric, smooth; the sepals triangular, sharp-pointed; the petals white, round; stamens with short anthers and filaments about twice as long as the petals; pods 5, about ⅛ inch long, smooth, shining, obovate, beaked; seed narrow, pointed at both ends, less than ⅛ inch long.

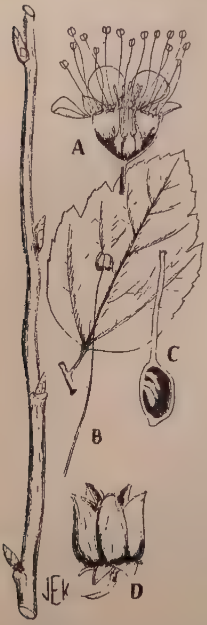

Fig. 28.—*Spiraea lucida* Dougl. Birch-leaved Spiraea

Twig, natural size; leaf, about one-half natural size; *A*, flower, ×5; *B*, stamen, and *C*, pistil, ×10; *D*, fruit, ×4.

This *Spiraea* is found from British Columbia to Oregon and east to Saskatchewan and Wyoming. In Montana it has been collected in Silver Bow County, in Ross Hole, and at Missoula, Helena, and other places. It is found in Yellowstone Park and in Idaho in Boise, Washington, and Kootenai counties. In British America it is reported from the valleys of the Rockies, from Iroquois Creek, and Kootenai and Pine passes, also from Banff and Field. It grows usually on open hillsides and in dry woods.

The plant described above seems to be the same as the one described by Hooker under the name *Spiraea betulifolia,* and what has also been considered as a variety of *S. corymbosa.* It is quite variable as to size and the marginal characters of the leaves, and is doubtfully distinct from *S. densiflora.* It was discovered in the early part of the last century and described by Douglas in 1833. It was collected by Richardson and Drummond on Sir John Franklin's expedition.

2. **Spiraea densiflòra** Nutt.

A shrub 1 to 1½ feet high, with slender, smooth, russet branches, the bark on older stems gray, often flaking off in thin layers; leaves mostly less than 1 inch long, ¼ to ¾ inch wide, ovate or oval, rounded or obtuse at the apex, rounded or angled at the base, margin bluntly or sharply serrate, usually entire toward the base, obviously veined beneath and almost completely smooth on both sides; petioles short; inflorescence compact, smooth; flowers about ⅛ inch broad, red; sepals triangular, sharp-pointed; petals round, with short stalk or claw; stamens numerous, extending beyond the outer organs of the flower; pistils very small; pods brown, smooth, shining, 3 to 4 times as long as the persistent sepals; seeds narrow, about 1/12 inch long.

The range of this plant extends from British Columbia to California and east to Montana and Wyoming. In Montana it has been found at Stanton Lake and in the Bridger and Little Belt Mountains, and in Idaho in Kootenai County.

In the most essential botanical features this form is very similar to *S. lucida* and by some botanists is considered at most a variety of that species, known as *S. betulifolia rosea* Gray and *S. arbuscula* Greene. It is difficult to find a mark positively identifying *S. densiflora,* but the size of the leaves, which seem to be uniformly smaller than those of *S. lucida,* the more compact inflorescence and the rosy color of the flowers are characters which apparently vary consistently toward a distinct form. Since, however, flower colors are known in some cases to be very inconstant and the leaf-marks cited may be found on plants of both kinds, it will not always be possible to differentiate with certainty between the two.

This plant seems to have been collected first by Nuttall in the Blue Mountains of Oregon, on his journey to the Pacific Coast about the year 1834, and a description was published in Torrey and Gray's *Flora of North America* in 1840. These authors regarded it as separated from the preceding only by the color of the flowers.

3. **Spiraea Menzièsii** Hook.

A shrub 3 to 4 feet high, with brown, somewhat pubescent, ascending branches and twigs, the bark on older stems exfoliating; buds small, flat, pubescent; leaves 1½ to 3 inches long, elliptic or oval, rounded or angled at both ends, serrately toothed above the middle, smooth and green on both sides, but slightly paler beneath; inflorescence red, narrowly pyramidal or cylindric, dense, pubescent on the branches and the calyces, the flowers small; sepals blunt; petals rose-color, oval, exceeding the sepals; stamens more than twice as long as the petals; pods brown, smooth, parallel, with evident beak.

This species is found from Alaska to Oregon and east to Idaho and Montana, in Idaho being found in Nez Perce and Kootenai counties, and in Montana at Libby, on the Kootenai River.

Spiraea Menziesii is very closely related to *S. Douglasii,* which follows, and is often cited as a variety of that species. It differs mainly in its lower stature and its smooth leaves; in size and form of the leaf and features of the flowers it is scarcely distinguishable. It was collected by Menzies on Vancouver's voyage and described by Hooker in 1833.

4. **Spiraea Douglásii** Hook.

Buck Brush.

A shrub 4 to 8 feet high, with rather straight, slender, and ascending branches, terminating in pale brown twigs covered with short matted hairs, the older twigs becoming smooth and deep reddish-brown; winter buds less than ⅛ inch long, flattened dorsally, hairy; leaves 1½ to 3 inches long, oblong, elliptical or oval, rounded or angled at both ends, serrately toothed above the middle, in some cases only at the top, smooth and green above but on the lower side grayish with matted hairs, which sometimes may be largely wanting except upon the veins; petioles short; inflorescence red, broadly pyramidal to nearly cylindrical, compact, hairy on the branches and the calyces, the flowers small; sepals blunt; petals round or oval, rose color; stamens with filaments several times longer than the petals; pistils inconspicuous; fruit of several small, parallel, finger-like, smooth, and beaked pods.

The range of *S. Douglasii* is from British Columbia to California and eastward in the north to the western slopes of the Rocky Mountains. In Idaho it occurs at Sand Point and in Montana on Lolo Creek. It probably reaches only the western part of Montana and in the more humid localities. It grows usually on the clay soil of swales and along creek bottoms, where it often forms dense low thickets covering acres of ground.

HOLODÍSCUS

Shrubs with alternate, simple leaves, without stipules. The inflorescence consists of small flowers borne in large panicles at the ends of short branches. The flowers consist of 5 sepals and, alternate with them, 5 petals, about 20 stamens, and usually 5 carpels opposite the sepals and surrounded by the entire disk, which is not lobed as in *Spiraea.* The chief point of distinction from *Spiraea,* however, lies in the fact that the small, 1-seeded pod does not open to release the seed.

This genus belongs to North America and is distributed from Oregon to Guatemala. About fourteen species are recognized by some authors which by others are included in two or three. Some forms are widely planted in the Eastern states for ornamental purposes, which they readily serve by their graceful habit and their large panicles of creamy white flowers. In the Rocky Mountains one species may be recognized.

Holodiscus ariaefòlius Greene

Ocean Spray. Fig. 29. Plate 19

A shrub 4 to 10 feet high, in most favorable localities sometimes 15 feet or more, with straight, upright stems, the twigs of the season light brown, hairy, older shoots covered with ashy gray, somewhat shreddy bark; buds small, pubescent; leave 1½ to 3 inches long, 1 to 2 inches wide, ovate-rounded or obtuse at the apex, wedge-shaped at the base and descending along the petiole, the margin lobed about the ends of the lateral veins, the lobes toothed at the summit, smooth above, more or less hairy beneath; petioles about ½ inch long, hairy; inflorescence several inches long in the form of an open, pyramidal panicle of creamy white flowers, the branches of the cluster pubescent, the individual flowers about ⅛ inch broad; sepals oblong or lanceolate oblong, greenish, petals white, elliptic, about as long as the sepals; stamens 15 to 20, slightly longer than the petals; pistils usually 5, small; fruit semi-ovate, straight on the inner and curved on the outer margin, about ⅛ inch long, including the beak.

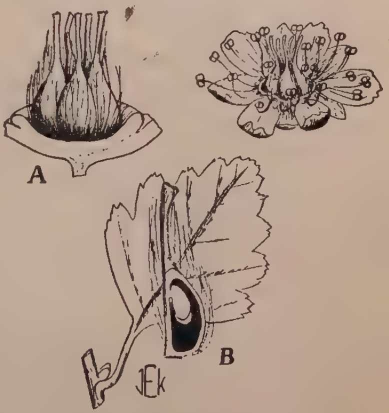

Fig. 29.—*Holodiscus ariaefolius* Greene. Ocean Spray

Leaf, about one-half natural size; flower, ×6; *A,* receptacle and pistils, ×15; *B,* pistil in section, ×20.

This species belongs to the Pacific Northwest and is found from the coast to the Rocky Mountains, where it occurs in the more humid situations in the Columbia drainage. In Idaho it has been collected in Kootenai and Washington counties and in Montana at Columbia Falls, Flathead Lake, and Missoula, and in Silver Bow County.

Lewis and Clark were the first to collect the subject of this description on the banks of the Kooskoosky River in Idaho in 1806. Since its first description by Pursh in 1814 under the name *Spiraea discolor* it has been known by at least a dozen different generic and specific names, which need not be recounted here. It is at present recognized under the names *Sericotheca discolor* (Pursh) Rydb. and *Holodiscus discolor* Maxim. Howell considered *H. ariaefolius* as restricted to the Pacific Coast west of the Cascades. It is also known under the common names of Hardhack and Arrowwood.

PÚRSHIA

The plants of this genus are diffusely and irregularly branched shrubs with clustered leaves and small triangular stipules. The flowers are solitary or few in the axils of the leaves, or terminal, and consist of a tubular or funnel-form receptacle on the margin of which are inserted 5 sepals, 5 petals, and 20 to 30 stamens. The pistil rises from the bottom of the receptacle, usually a single carpel free from the tube, tapering upward into a narrow style, the ovary containing but one ovule, the stigma lateral formed of papillae along the everted lips of the longitudinal groove of the style. The seed is obovate, with a membranous coat, covering a layer of deep purple, resin-like, intensely bitter, granulated matter.

This is a North American genus of which two species are now known. It is widely distributed over the western part of the continent.

The genus has no known economic value and owing to its lack of attractive qualities is not widely planted.

Purshia tridentàta (Pursh) DC.

FIG. 30

A widely branching erect shrub, 4 to 8 feet high, dark-colored, bark of the branches from pale to dark gray; leaves about ½ inch long, in some cases more, wedge-shaped, the summit divided into three oblong lobes, the base tapered into a very short petiole, margins somewhat rolled toward the lower side, green but with gray hairs on

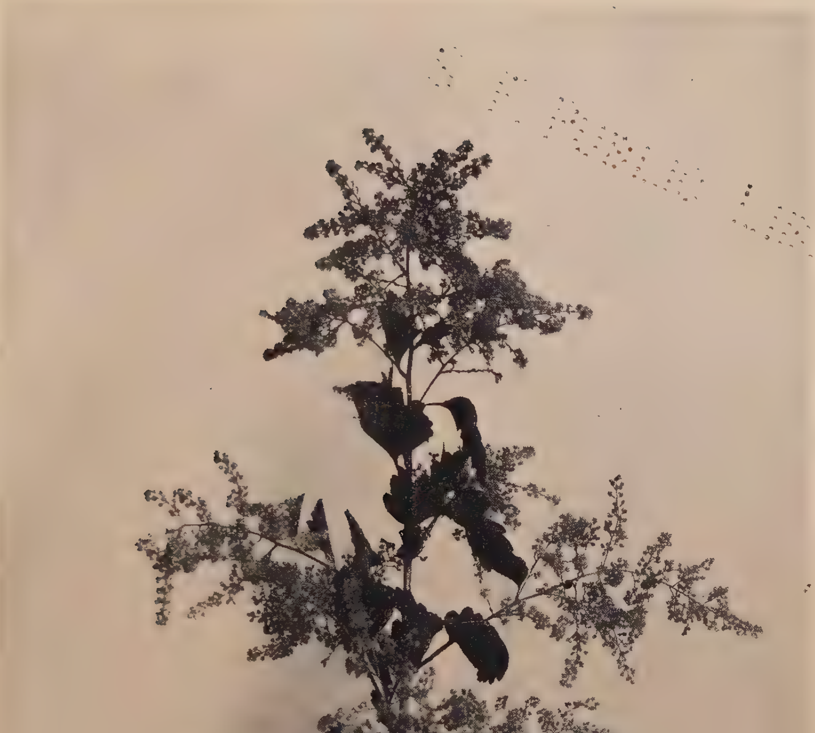

PLATE 19 (p. 157) *Holodiscus ariaefolius* Greene

Ocean Spray from the vicinity of Missoula, Montana

the upper surface, densely white woolly beneath; flowers solitary on short stalks at the ends of short branches, the receptacle funnel-form, about ¼ inch long, hairy and densely glandular, sepals oblong, blunt, hairy, about ⅛ inch long; petals yellow, spatulate, longer than the sepals, with slender stalk or claw, stamens shorter than the petals, pistil not equaling the stamens; fruit ¼ to ⅜ inch long, ⅛ inch thick, pointed at both ends, clothed about the lower half by the persistent receptacle and calyx and entirely covered with a fine, close, gray pubescence.

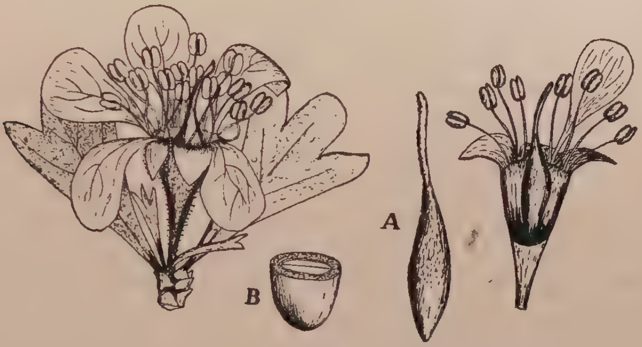

Fig. 30.—*Purshia tridentata* (Pursh) DC.
Shoot and flowers, ×2½; *A*, pistil, ×5; *B*, seed.

Purshia tridentata is found from British Columbia to California and throughout the Rocky Mountains, mostly within the borders of the United States. In Montana it has been collected at many places along the Madison and Flathead rivers, on the East Fork of the Bitterroot near Medicine Springs, on Boulder Creek, and at Deer Lodge and Priest Pass. In British America, Macoun reports it in the Kootenai Valley.

The first observation of this plant dates from the record of Lewis and Clark, which states that it is "almost the only shrub to be seen through an immense tract of barren sandy soil from the head sources of the Missouri to the Falls of the Columbia, and from 38 to 48 degrees of north latitude," an extravagant statement, since the plant is comparatively rare in Montana except on the open, sunny foothills in the upper Bitterroot Valley, which the Lewis party traversed on the westward journey, where, however, it does occur in abundance. Subsequent observations were made by Douglas, Wyeth, and Nuttall, the last stating that it is neither prevalent nor abundant south of 42 degrees.

The plant was first described by Pursh in 1914, from material collected by the Lewis and Clark expedition, who referred it to the genus *Tigarea*. In 1816 the genus *Purshia* was established for it by De Candolle. It is also known in some of the manuals as *Kuntzia tridentata* Spreng.

CERCOCÁRPUS

Trees or shrubs, with simple, alternate, stipulate leaves. The flowers are in axillary clusters. Each flower consists of an elongated tubular receptacle, which is slightly dilated below and abruptly expanded above into a saucer-shaped limb divided into 5 lobes (sepals). Petals are wanting, but stamens to the number of about 20 are inserted about the throat of the tube. The pistil, formed of a single carpel, is sessile at the bottom of the receptacle and is elongated upward into a slender, hairy style, which bears at its summit a small stigma. As the fruit begins to form, the upper part of the tube, with stamens and sepals attached, parts from the lower part of the receptacle by a circular abscission, leaving the latter as an envelope about the ovary. The hairy investment of the style increases with its elongation resulting in a plumose appendage, which assists in the dispersal of seeds by the wind. The ovary contains a single, linear, cylindrical seed.

Cercocarpus is a North American genus confined mostly to the western side of the continent. The species, of which some authors find as many as twenty, are more abundant in the southern part of the area, which extends from Washington and Montana to Mexico. Two species occur in the northern Rockies. The history of the genus dates from the description by H. B. Kunth in 1823, when that of the first species, collected near Mexico City, was published under the name *Cercocarpus fothergilloides*. The common name, Mountain Mahogany, is applied to the various species.

The plants produce a hard, dark-colored wood, which has a few minor uses. Owing to unattractive appearance they are seldom planted.

KEY TO THE SPECIES OF CERCOCARPUS

Leaves broadly obovate.................................... 1. *C. montanus*
Leaves narrowly elliptical.................................. 2. *C. ledifolius*

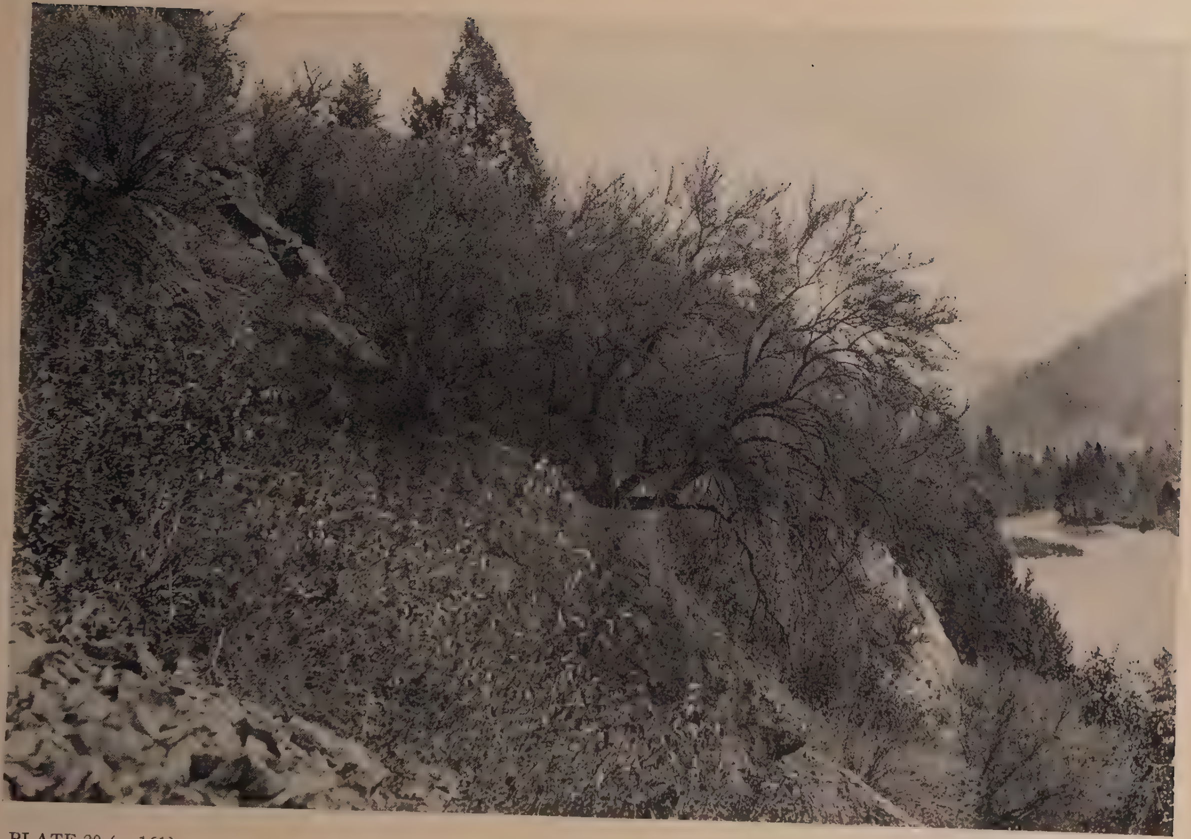

PLATE 20 (p. 161)

Cercocarpus ledifolius Nutt.

Mountain Mahogany in August on the west fork of the Bitterroot River in Montana

1. **Cercocarpus montànus** Raf.

Birch-leaved Mahogany

A shrub, 4 to 6 feet high, with grayish bark, marked by longitudinal fissures on the older stems, but on the younger smooth, twigs widely branched, sparingly hairy when young; leaves ½ to 1 inch long, ¼ to ½ inch wide, obovate, rounded at the apex, wedge-shaped at the base, bluntly toothed above the middle, hairy on both sides, often densely hairy beneath, green above, pale and veiny beneath; petioles short; flowers solitary or few in the axils of the leaves, on slender stalks, tube ¼ to ½ inch long, narrow, expanding above into a bowl-like dilation bearing short, blunt sepals and numerous stamens, the whole flower, measuring ½ to ¾ inch long; fruit, including the elongated feathery style, 2 to 3 inches long, enveloped below by the cylindrical, slightly pubescent, brown tube of the receptacle.

The northern line of distribution of the plant described above seems to extend from South Dakota and the Black Hills through southern Montana and northern Wyoming through Idaho to Oregon; southward the area of its distribution covers the Rocky Mountains to Mexico, reaching east to Kansas and west to California.

The plant was first discovered by Nuttall "in bushy ravines on the sources of the Platte" in the mountains of Colorado and described by him in 1838–1840 under the name *Cercocarpus parvifolius*. Under an earlier date, however, Rafinesque, in 1832, applied to this plant the name, *C. montanus,* which is now in use.

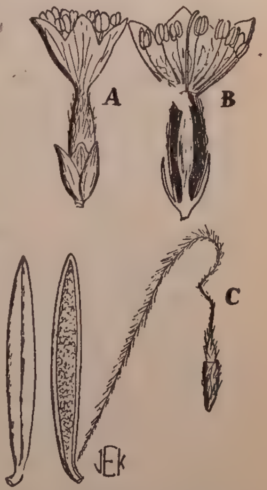

FIG. 31. — *Cercocarpus ledifolius* Nutt. Mountain Mahogany

Leaves and fruit, *C*, natural size; flowers, *A* and *B*, ×2½ and 3 respectively.

2. **Cercocarpus ledifòlius** Nutt.

Mountain Mahogany. FIG. 31. PLATE 20

A tree, in the Rocky Mountains 10 to 15 feet high, with short trunk, much branched from near the base into a wide-spreading crown, bark gray, furrowed and broken into persistent scales, young shoots covered with long hairs, later becoming smooth; leaves an inch long more or less, ⅛ to ¼ inch wide, elliptical, pointed at both ends, on short petioles, margin entire, rolled toward the lower side, smooth above, hairy beneath; flowers usually solitary in the axils, tube and all less than ½ inch long, tube white, woolly, terminating in a bowl-shaped expansion bearing short, blunt sepals and numerous stamens with slender filaments; fruit, including appendage, 2 to 3 inches long, the persistent tube remaining woolly.

This is a plant especially of the Great Basin region, extending its range eastward into the mountains of Colorado, north into Montana, Idaho, and Washington and west into Oregon and California. In Montana it occurs on rock outcrops of dry hills in the southwestern part of the state on the East and West Forks of the Bitterroot River, along the Madison River and at Lombard, and reaching as far north as Helena. It was first discovered on the hills near Bear River in southern Idaho by Nuttall and described by him in 1838–1840.

OPULÁSTER

The plants of this genus are shrubs with bark which exfoliates in thin layers, giving to the members of the group the common name of ninebark. The leaves are alternate in position, palmately veined and lobed and usually bearing branched hairs of the stellate form. The flowers are in terminal clusters on short lateral branches, the convex cluster usually made broader than long by the lengthening of the lower pedicels. The shallow receptacle of each flower bears on its margin 5 sepals, and, alternate with these, 5 petals, usually white, and stamens varying in number from 20 to 40. The central part of the flower is occupied by 5 carpels, distinct from one another, sometimes stalked, bearing terminal filiform styles, each capped by a small stigma. The ovaries ripen as small, inflated pods, which when ripe open by both inner and outer sutures to release the several narrow, hard, and shiny seeds.

At most thirteen species have been recognized as belonging to North America and another in northeastern Asia. Of the seven or eight species native to the Rocky Mountains, two may be considered as occurring in the northern ranges.

The Opulasters are attractive shrubs and are often planted for ornamental purposes. The exotic *Opulaster amurensis* Kuntze is introduced from Asia. These plants are sometimes known as *Physocarpus* and were formerly included under the genus *Neillia.* The first species of the genus was described by Linnaeus in 1753 under the name *Spiraea opulifolia,* and known as *Opulaster opulifolius.*

KEY TO THE SPECIES OF OPULASTER

Carpels usually 2, fruit white-hairy........................ 1. *O. malvaceus*
Carpels 3 to 5, fruit smooth................................ 2. *O. capitatus*

1. **Opulaster malvàceus** (Greene) Kuntze

Ninebark. FIG. 32

A shrub, 3 to 5 feet high, with erect stems, branching at wide angles to form a rounded top, bark on older stems gray or yellowish, exfoliating in one thin layer after another, the young twigs brown, often covered with straggling white hairs through the first season; winter buds about ¼ inch long, ovate, pale in color, covered with a soft felt of fine hairs; leaves 1 to 3 inches long, 1 to 2 inches wide, broadly ovate to orbicular or reniform, usually 3-lobed, acute to rounded at the apex, angled or cordate at the base, margin divided into many small blunt or rounded teeth, the upper surface at maturity nearly or quite smooth, the lower more or less covered with short, branched hairs; green above, paler beneath; petioles much shorter than the blades, smooth or pubescent; stipules ovate, lanceolate, thin, papery, brown; inflorescence 1 to 2 inches across, convex or hemispheric in form, numerous, hairy on the main axis and lateral branches and the calyces; flowers about ⅜ inch in diameter, the receptacle bell-shaped or hemispheric; sepals ovate, paler, ⅛ inch long; petals white, orbicular or broadly oval, considerably exceeding the sepals; stamens numerous, inserted on a ring encircling the two white, hairy pistils seated at the bottom of the cup formed by the receptacle; fruit, two swollen, partially united, densely pubescent pods, partially enclosed by the converging lobes of the calyx; seeds elliptical or pyriform.

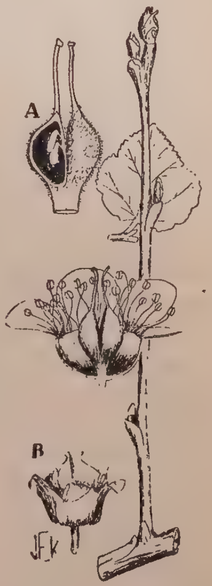

FIG. 32. — *Opulaster malvaceus* (Greene) Kuntze. Ninebark

Twig, about natural size; leaf, about one-half natural size; flower, ×2½; *A,* pistil, ×4; *B,* fruit, ×2.

The distribution of this plant from British Columbia to Oregon and thence to the Rocky Mountains of Idaho, Montana, and Utah is evident by its appearance on the rocky and dry slopes of the sunny foothills of its range. In Idaho it is found in Boise, Nez Perce, and Kootenai counties; in Montana at Missoula, Clinton, Spanish Basin, Bridger, and Belt Mountains, Sixteen Mile Creek, and Ross Hole; in the Canadian Rockies, in the upper Columbia Valley.

This species was first collected on the shore of Lake Pend d'Oreille in Idaho and described by Hooker as *Spiraea opulifolia* in 1832.

2. **Opulaster capitàtus** (Pursh) Kuntze

A shrub of medium height or sometimes extending branches among those of neighboring plants for a length of 20 feet, propagating from the rootstock by shoots, with brown or grayish branches and slender twigs; leaves 1 to 3 inches long, 1 to 2 inches wide, more often broadly ovate, varying to orbicular and reniform, acute or rounded at the apex, truncate or cordate at the base, usually 3-lobed, the margin closely cut into numerous small teeth, smooth above, pubescent beneath with branched hairs; inflorescence at the ends of slender, leafy twigs, almost globose, axis, pedicels, and calyx covered with short hairs, flowers nearly ½ inch across, the sepals ovate or lanceolate, acute, about ¼ inch long, the petals white, orbicular, shorter than the sepals; stamens numerous; the pistils 3 to 5, short; fruit inflated, brown or purplish, mostly smooth at maturity but occasionally bearing scattered stellate hairs.

The range of *Opulaster capitatus* extends from southern British Columbia to California and east to Idaho and probably the western slopes of the Rockies in Montana. It is said to grow sometimes with much extended stems interlaced among willows and other shrubs.

From the material collected by Lewis on the banks of the Columbia River an imperfect specific description was written by Pursh in 1814, as *Spiraea capitatus.* A dozen or more names have been applied to this form up to 1891 when the name here used was given by Kuntze.

BOSSÈKIA

The plants of this genus are of medium height or low, with somewhat shreddy bark. The leaves are alternate, entire, maple-like in their palmate lobing, and veining. The flowers are large but in small terminal clusters borne on long peduncles. The receptacle is flat or but slightly convex, the sepals pointed or with leafy tips, petals 5, white or pink, oval or orbicular; stamens numerous in several series, with slender filaments and deeply cordate anthers. The numerous pistils occupy the center of the flower, with smooth, club-shaped styles and slightly 2-lobed stigmas. The fruit is an aggregation of small, pulpy carpels, resulting

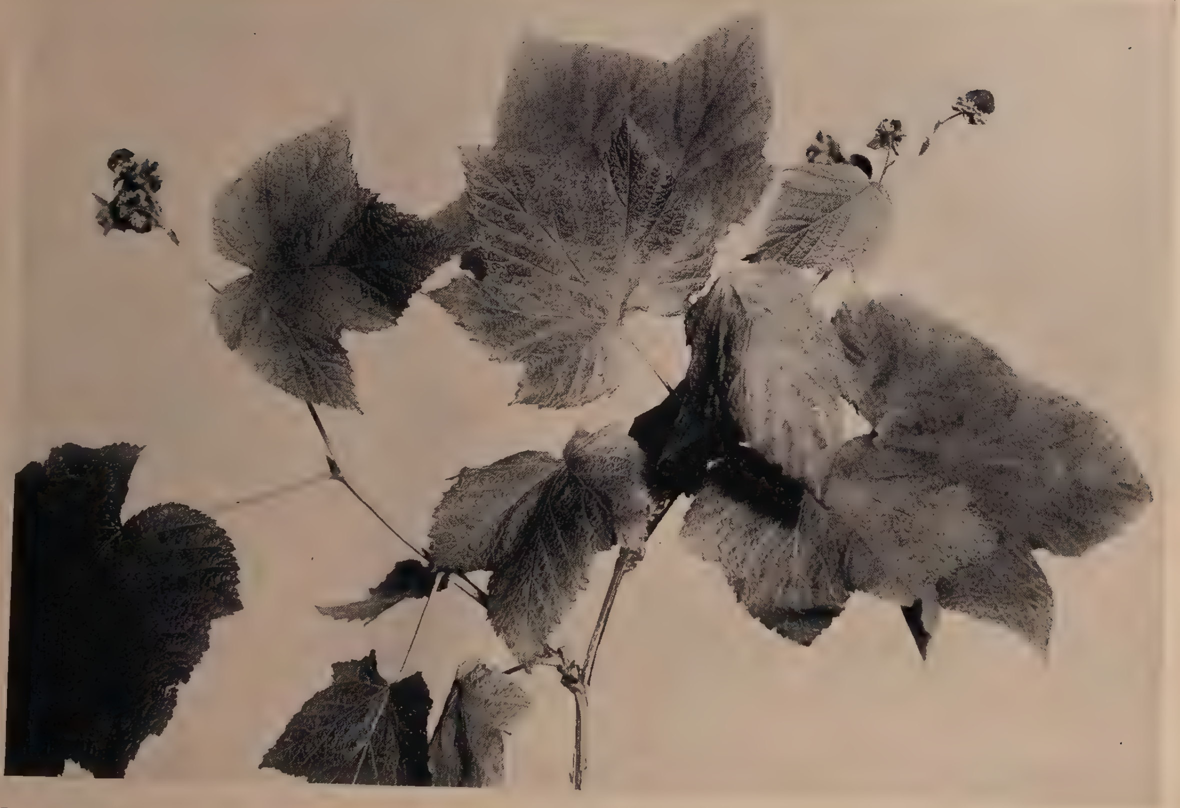

PLATE 21 (p. 165)

Bossekia parviflora (Nutt.) Greene

Thimbleberry from the vicinity of Missoula, Montana from the fleshy development of the ovaries, adhering laterally to one another and separating collectively from the receptacle like a shallow inverted bowl. Each carpel or drupelet containing a single seed is capped by a dry, firm, hairy cushion from under the border of which the style ascends.

Of this genus four species are at present described, two of which belong to the Atlantic and two to the Pacific slope. But one is found in the Rocky Mountains.

Bossekia was first named by Necker in 1790. In 1903 Rydberg proposed *Rubacer* as a new name to designate this group. For many years, however, and still in some manuals, these species have been included under *Rubus,* but they differ from the latter in having simple leaves, smooth stems, and a few other marks which seem to justify their being treated separately.

Bossekia parviflòra (Nutt.) Greene

Thimbleberry. Fig. 33. Plate 21

A shrub, 3 to 5 feet high, with erect stems, widely branched, shoots of the season green, more or less evidently covered with glandular hairs, enveloped at the base by the persistent scales of the winter buds, older stem brown or gray, the bark shredding or exfoliating in thin layers; winter buds gray, the outer and inner scales densely coated with appressed silky hairs; leaves reaching 6 to 8 inches in diameter, rotund in form, with blunt or acute apex and cordate base, usually 5-lobed, resembling a maple leaf, the margin cut into many small slender teeth, or into wider ones with slender apical points, green and sparingly hairy on both sides; petioles about as long as the blades, hairy; stipules ¼ to ½ inch long, narrow, margined by slender, white hairs; inflorescence terminal, bearing 5 to 10 or more flowers, glandular-hairy, each pedicel subtended and enveloped below by a broad pubescent bract, the flower 1½ to 2 inches broad; sepals 5, ovate, with long attenuations, thickly covered with hairs, white-margined; petals white, broadly oval; stamens many; pistils many, crowded on the receptacle; fruit red, convex, pubescent, parting from the receptacle in a thin layer of coherent carpels, sweet and edible, ½ to ¾ inch broad.

The Thimbleberry is found from Michigan and western Ontario to the Pacific Coast, where it is one of the most common shrubs from Alaska to northern Mexico. In Montana it has been collected at Missoula, Bozeman, Glacier Park, in the Flathead and Bitterroot valleys, and in many other places; also in the Canadian Rockies at Glacier and Marion and Emerald lakes.

Throughout the whole region this is one of the commonest shrubs along bushy creek bottoms, on hillsides in open woods and elsewhere, controlled largely by suitable conditions of soil moisture, up to altitudes of 4,000 feet or more. It is also known as Salmonberry, owing to the salmon pink of its fruit, although the true Salmonberry is quite another plant, and also as False Raspberry. The specific designation "parviflora," meaning small flower, is a misnomer.

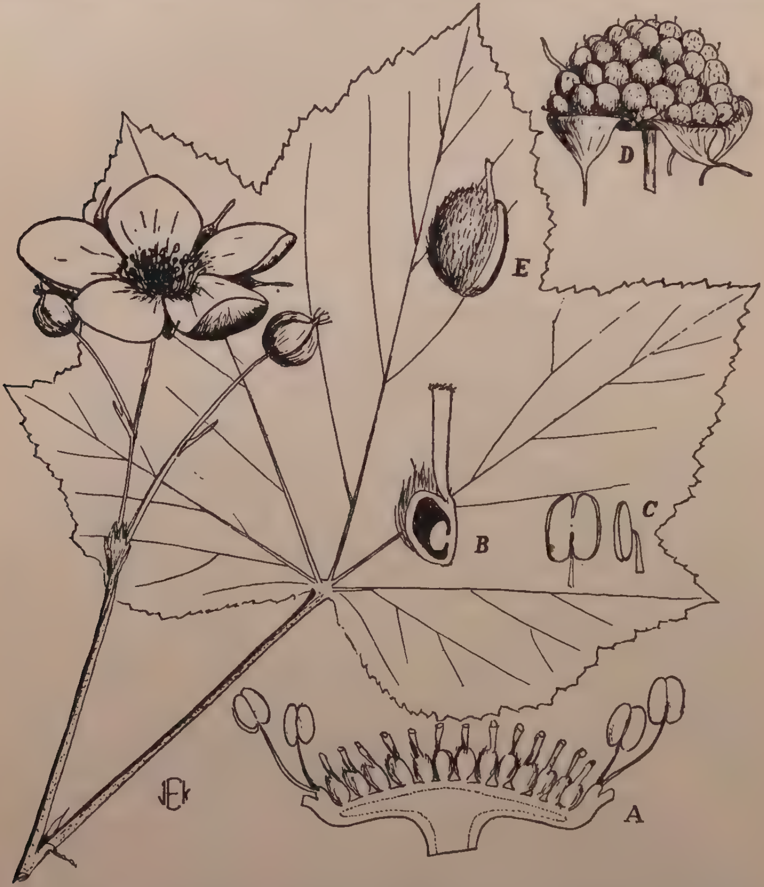

FIG. 33.—*Bossekia parviflora* (Nutt.) Greene. Thimbleberry
Flower and leaf, about four-fifths natural size; *A*, receptacle, ×6; *B*, pistil, ×16; *C*, anthers, ×8; *D*, fruit, ×1½; *E*, druplet, ×8.

The plant was first found on the shores of Lake Huron and described by Nuttall in 1818 as *Rubus parviflorus*. It was also described under the name of *R. nutkanus* Moc.

CHAMAEBATIÀRIA

Low shrubs, stout, widely branched, somewhat pubescent and glandular. The leaves are aromatic, much divided and compound, leathery in texture, and stipulate. The inflorescence is a terminal leafy panicle; each flower has a turbinate receptacle, 5 sepals, 5 white petals, and 5 pistils; the stamens are numerous. The pistil consists of an ovary containing about 9 ovules; the style extends from the top of the ovary, with a cap-like stigma at its summit. The fruit is a leathery pod, opening mostly along its inner suture. The seeds are few, unappendaged, containing an oily, fleshy endosperm adherent to the seed coat.

Two species are reported, both found in the central and southern Rocky Mountains and parts of California. It may not come within our range, but as it has been found in Idaho, the species of more northern range is described here.

Chamaebatiaria millefòlium
(Torr.) Maxim

Fig. 34

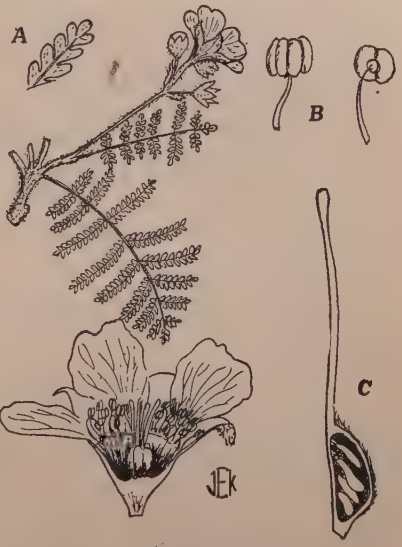

Fig. 34.—*Chamaebatiaria millefolium* (Torr.) Maxim

Shoot, natural size; *A*, detail of leaflet, ×2; *B*, stamens, ×7; *C*, pistil, ×7; flower, ×3.

A shrub, less than 3 feet high, with brown bark on the younger twigs, more or less densely covered with branched star-like hairs; the old stems are smooth and gray; leaves narrowly lanceolate in outline, more or less clustered toward the ends of the branchlets, with numerous main divisions and minute, oblong, blunt leaflets; stipules small, deciduous; inflorescence 1 to 4 inches long, the flowers small; sepals lanceolate, sharp-pointed; petals rounded, about as long the many stamens; pods about ⅙ inch long, smooth.

In the botany of the Pacific Railroad Survey this plant was described by Torrey in 1857 as *Spiraea millefolium.* It was first discovered in the Williams Mountains of Arizona.

POTENTÍLLA

The plants of this genus are mostly herbs; only one of ours is a shrub. It is a plant of low stature, with pinnate or palmately compound leaves, more or less conspicuous stipules attached laterally to the petioles. Flowers are sometimes solitary in axillary position or in terminal clusters of cymose structure. The receptacle is concave at the bottom, on the margin bearing 4 to 5 sepals, and alternate with these and slightly below an equal number of smaller bracts. Petals are 4 to 5 and alternate with the sepals, and along with the numerous stamens are inserted on the margin of the receptacle. The base of the receptacle is lined with a glandular disk and at the center a convex elevation bears an indefinite number of 1-ovuled carpels. Each carpel or pistil bears a more or less laterally inserted style, with a capitate stigma. The ovule is attached near the insertion of the style, which is on the side nearer the center of the flower. The fruit is a very small, 1-seeded, dry development of the ovary (achene), which separates from the receptacle at maturity, like a small seed.

The Potentillas are nearly world-wide in their distribution, though especially numerous in the North Temperate Zone. A large number of species are on record. As in many other cases, however, instability of the botanical characters makes their classification difficult and uncertain. Several groups have been segregated under the generic names, *Dasiphora, Argentina,* etc. In the narrower sense one author lists one hundred and seventy-six species of *Potentilla* for North America and eighty for the Rocky Mountains.

The herbaceous Potentillas are among the most common of our weeds and wild flowers of fields and open woods. The structure of the flower is much like that of the strawberry, but in the fruiting condition the receptacle of the former remains dry and the carpels fall away separately. There are a few garden forms, some of which are hybrids with simple or double flowers.

Potentilla fruticòsa L.

Shrubby Cinquefoil. Fig. 35

A shrub, about 2 feet high, with upright branches, the bark on older stems shreddy, brown, on the younger gray, more firm; shoots of the season green, hairy, slender; leaves less than 1 inch long, broader than long, compound by division into 3 to 5 segments, the leaflets oblong, elliptic or oblanceolate, usually sharp-pointed, the margin entire, often rolled toward the lower side, bearing on both sides long, white, appressed hairs; petioles ⅛ to ¼ inch long, slender; stipules as long or longer than the petioles, sheathing, papery, yellowish-brown; flowers in small loose clusters or solitary, yellow, ¾ to 1 inch broad; sepals triangular, sharp-pointed, the bracts narrower and longer; petals rounded, ¼ or nearly ½ inch long; stamens short, surrounding the shorter, hairy pistils; achenes covered with long straight hairs.

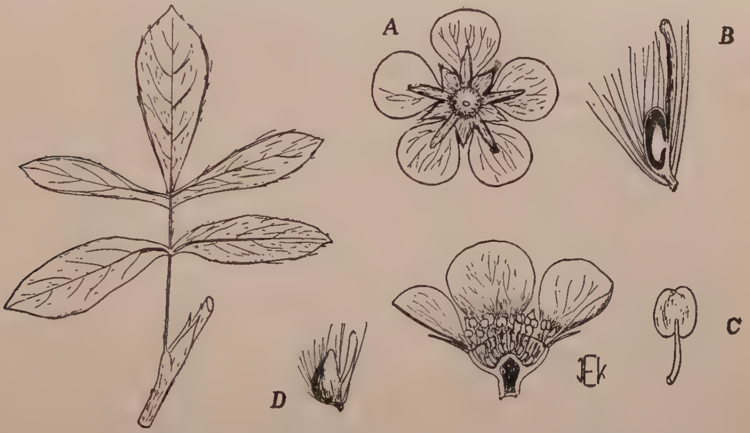

Fig. 35.—*Potentilla fruticosa* L. Shrubby Cinquefoil
Leaf, ×2; *A* and *a*, flowers, ×1 and 2 respectively; *B*, pistil, ×14; *C*, stamen, and *D*, achene, ×7.

Potentilla fruticosa is found around the world in the Northern Hemisphere. In North America its range extends from Labrador to Alaska and from the Arctic Circle to New Jersey, Illinois, Arizona, and California. It is found on wet soil along stream bottoms and elsewhere in the open, in Montana at various altitudes. The following localities may be mentioned: Jocko River, Pony Mountains, East Boulder, Blackfoot Valley, Spanish Peaks, and Yellowstone Park at Mammoth Springs. In Idaho it occurs on Mount Chauvet and commonly on stony soil in the Canadian Rockies.

RÙBUS

Raspberries and Blackberries

This genus includes both shrubby and herbaceous species, usually bearing spines or bristles scattered irregularly along the stems and leaf stalks. As a rule the stems of the shrubby forms are not strongly woody, but rather biennial in character, making vigorous growth the first year, bearing fruit the second, and then becoming weak or dead. Shoots from season to season are supplied anew from the perennial rootstock to make good the decay of the older stems. The leaves are alternate in position, with distinct petioles and conspicuous stipules; the blade of the leaf is commonly compound, pinnately divided in 3 to 5 leaflets, in some instances regularly 3-parted and in a few cases simple, like those of the pear or plum. The flowers are usually borne in clusters, though sometimes solitary, and appear on the ends of short lateral shoots or in the axils of leaves. Each flower consists of 4 series of members, sepals, petals, stamens, and pistils. The receptacle is in form like a shallow dish, in the center of which is an elevated cone-like portion upon which are inserted the numerous pistils. Between the central elevation and the margin is an interval lined with glandular, nectariferous tissue. On the margin are inserted from within outward the numerous stamens, the usually white petals, 5 in number, and finally the 5 green, pointed sepals, alternate in position with the petals. The petals and sepals are usually imbricated in the bud, though in certain species they early cease to overlap and appear valvate. The pistil consists of a small ovary, containing a single seed attached to the wall on the side toward the center of the flower, a slender style which extends from the top of the ovary and bears on its summit the stigmatic surface. The ovaries in fruit ripen into colored, juicy globules which separate collectively from the receptacle, as in the familiar raspberries and blackberries. In the former the ovaries or carpels adhere to one another laterally and separate like a cap from the convex receptacle; in the latter they adhere to the conical tissue on which they grow, which separates at its base from the rest of the receptacle and forms the "core" of the aggregate fruit.

The genus *Rubus* is world-wide in its distribution, though the majority of the species belong to the North Temperate Zone around the world. Fifty years ago as many as five hundred species had been announced, and at the present time it may be said that as many as three thousand specific names have been applied to plants of this group. Although many of these have been abandoned and others are contested, there still remains a formidable list, upon the accuracy of which no two authorities can be found to agree. The *North American Flora* describes one hundred and twelve species. Rydberg's *Manual* cites sixteen belonging to the Rocky Mountains. In these instances *Rubus* is treated in the narrower sense, certain sections of the genus as formerly known having been segregated under other names (*Bossekia, Oreobatus,* etc.). The shrubby forms of the northern Rocky Mountains for the present purpose can be included under five specific designations.

The extreme variability, especially in the vegetative parts, of the species of *Rubus* is responsible for the great confusion now existing in the classification. The botanical characters upon which the classification is based differ widely in old and young plants, and even on the same shoots at different times of the year, and they appear to be readily susceptible to environmental conditions. Furthermore, forms intermediate between the more emphatic species appear in abundance. These are often listed as hybrids, of which long lists may be found in the recent literature of the subject.

The name *Rubus* dates back to Linnaeus in 1753, since when at one time or another it has been known as a whole or in part under no less than sixteen different genera. As one of the most common wild plants and widely cultivated, it was early observed and has received much attention from different angles of botanical interest. Many native and exotic forms are widely planted, not only for the ornamental qualities of flowers and foilage, for there are numerous hybrids of horticultural origin.

KEY TO THE SPECIES OF RUBUS

- Leaves white beneath with matted hairs
  - Fruit red .... 1. *R. strigosus*
  - Fruit black .... 2. *R. leucodermis*
- Leaves not white beneath
  - Stems smooth or sparingly armed
    - Stems woody, flowers red.......................... 3. *R. spectabilis*
    - Stems biennial, flowers white...................... 4. *R. paramoenus*
  - Stems strongly armed with hooked spines............ 5. *R. laciniatus*

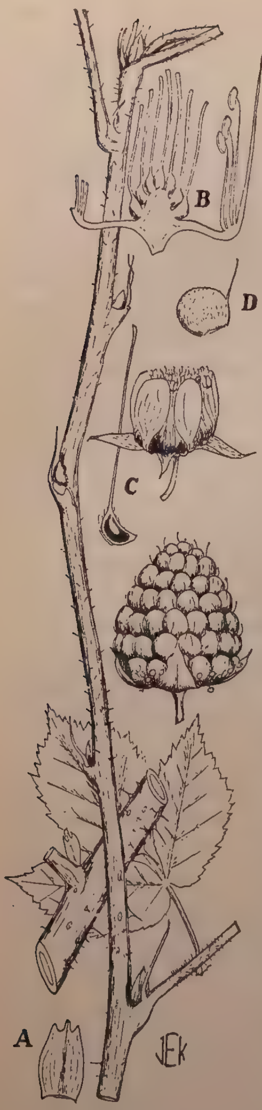

FIG. 36.—*Rubus strigosus* Michx. Western Red Raspberry

Twigs and leaf about natural size; *A,* budscale, ×2; *B,* receptacle, ×3; *C,* pistil, ×5; flower, ×2; fruit, natural size; *D,* druplet, ×2½.

1. **Rubus strigòsus** Michx.

Western Red Raspberry

FIG. 36. PLATE 22

Stems 3 to 6 feet high, brown or reddish, sometimes covered with a bluish bloom, more or less beset with stiff hairs or bristles and a few glandular hairs, small winter buds in the axils of the leaves on the young shoots, flat, formed of a few loosely overlapping scales, which are hairy at the summit; leaves on the stems of the season with blades 4 to 6 inches long, broadly ovate in outline, with taper-pointed apex and cordate base, compound by division into 3 to 5 segments, the lowermost sometimes imperfectly subdivided, the leaflets all with narrowed points, somewhat rounded at the base, the margin serrate with teeth produced into small, bristle-like points, the upper surface smooth, green, the lower whitish with densely matted, short hairs; petioles much shorter than the blades, round, the surface similar to that of the shoot; stipules very narrow, variable in length; leaves of the fruiting branches as a rule bearing 3 segments instead of 5, smaller, relatively more coarsely toothed; stipules very small; flowers in terminal clusters on short lateral shoots or in the axils of leaves on the same shoot, usually less than ¾ inch across; sepals wedge-shaped, long-pointed, covered with a fine, close pubescence; petals white, elliptic, erect, about ¼ inch long; stamens and pistils numerous; fruit red, sweet or slightly acid, length about equaling the breadth, ½ to ¾ inch.

The range of this species seems to be transcontinental, unless we accept the distinctions made by some authors between the eastern and western forms. Throughout western Montana it is common along all river bottoms

PLATE 22 (p. 172) *Rubus strigosus* Michx.

Western red raspberry from Lolo Valley

and canyons. It has been collected at many places including Red Lodge, Clinton, Missoula, Lolo Valley, Judith Basin, Spanish Basin, and Belt Mountains; in Idaho at Trinity Lake and elsewhere; in British America it is reported from Nova Scotia to the Coast Range of British Columbia, abundant and prolific in burns.

The original collection of *Rubus strigosus* was made in the mountains of Pennsylvania, and described by Michaux in 1803. Since then specimens referred to this species by reputable botanists have been collected at many points across the country and throughout the Rocky Mountains from British America to Arizona and on the coast from Alaska to California. In 1896 Focke described *R. melanolasius* from plants grown in Europe from seeds collected in northwest America and to this species some recent authors have assigned the Rocky Mountain plants. The published descriptions of the two are very similar and leave little range for the fluctuating variations which are among the most conspicuous features of the genus. Another form, *R. acalyphaceus* (Greene) Rydb., which is regarded by Rydberg as doubtfully distinct from *R. melanolasius,* was collected by Lieutenant Mearns in Yellowstone Park in 1902, and on the basis of its somewhat more numerous and stronger prickles was described by Greene as a species in 1906. Attention may here be called to another species described by Greene under the name *Batidaea subarctica* [*Rubus subarctica* (Greene) Rydb.], which may be merely a northern form of *R. strigosus.* The stems are densely and finely hairy and at times even white with matted pubescence. Other parts of the plant also are more hairy than in typical *strigosus.* This form is transcontinental from Newfoundland and Quebec to Alaska and British Columbia.

2. **Rubus leucodérmis** Dougl.

Black Raspberry

Stems 4 to 6 feet high, armed with stout, recurved spines, the older dark or yellowish colored, often covered with a pale bloom, the young shoots green, without hairs; leaves on the stems of the season with blade 3 to 5 inches long, divided into 3 to 5 segments, broadly ovate in outline, taper-pointed at the apex, cordate at the base, leaflets long-pointed at the apex, rounded at the base, the margin doubly serrate with sharp-pointed teeth, slightly bristle-tipped, smooth above but white beneath, with dense short pubescence; petioles shorter than the blades, armed with recurved prickles like those on the stems; stipules long, very narrow; leaves on flowering shoots smaller, with 3 leaflets, otherwise similar; flowers in small clusters, terminal on short lateral branches from the buds of the preceding year, or in the axils of the leaves of the same, peduncles prickly, the flower about ½ inch broad; sepals hairy, lanceolate, long-pointed, ¼ inch long or more, spreading in fruit; petals much shorter than the sepals, oblong or elliptical; stamens and pistils many, scarcely longer than the petals; fruit hemispheric, dark purple or black, ⅜ to ⅝ in diameter, covered with a bloom and somewhat pubescent, sweet and palatable.

This plant is found from British Columbia to California and east to Montana and Utah. In Montana it has been found at Columbia Falls and in the Canadian Rockies near the sources of the Columbia River, where it was first collected by Douglas. For a time it was identified with the eastern *R. occidentalis.* It is probably rare in Montana, except in humid localities in the western part of the state. It grows best in open woods and burns and requires a good deal of light.

3. **Rubus spectàbilis** Pursh

Salmonberry

Stems woody, reaching sometimes a height of 15 feet, with yellowish, exfoliating bark and rather straight, ascending branches; the shoots pubescent when young, with slender, straggling hairs and a few weak prickles, older shoots sometimes prickly, often smooth; winter buds about ¼ inch long, soft, the overlapping scales covered with grayish, appressed hairs; leaves usually compound by division into 3 segments, sometimes incompletely divided, broadly ovate in outline, the apex long-pointed, the base of the blade and that of the leaflets usually rounded, the margin doubly cut into many serratures, the surface smooth above and below, except usually along the veins; petioles slender, round, shorter than the blades, slightly hairy; stipules very narrow, thread-like; flowers mostly solitary, in more vigorous cases in terminal clusters of 3 to 5 on lateral shoots from buds of the previous season, the pedicels hairy, calyx large, about 1 inch broad, including the receptacle; sepals ovate, taper-pointed, hairy; petals red or purple, oval or elliptic, sometimes nearly an inch long; stamens numerous, filaments linear, somewhat dilated; fruit red or yellow (salmon color), nearly an inch long, watery, edible, the drupelets smooth, bearing the persistent styles.

The range of the Salmonberry extends from Alaska to California and east to the Rocky Mountains in Idaho and Montana. It is rare in Montana except in the extreme western or more humid part of the state. It occurs along streams in cooler woods, often in its most favored range occupying exclusively the sandy creek bottoms.

4. **Rubus paramoènus** (Greene) Rydb.

Stems 3 to 6 feet high, dying after 2 years, yellowish-brown, usually lustrous, smooth, sparingly armed with slender bristles or in age smooth; leaves of stems of the season with blade 4 to 6 inches long, divided into 3 to 5 segments, the terminal one cordate or ovate, sometimes 3-lobed, tapering at the apex, sharply and doubly serrate, the lateral leaflets obliquely ovate or lanceolate, sessile, somewhat smaller than the terminal, the whole blade light green, thin, bristly on the veins beneath, only sparingly grayish hairy beneath when young, smooth on both sides at maturity; petioles nearly as long as the blade, bristly but otherwise smooth; stipules slender, attached to the petioles; leaves of the flowering shoots bearing 3 leaflets which are shorter and broader and slightly more hairy beneath; flowers in small clusters, terminal on the lateral shoots, the inflorescence glandular and bristly up to the calyx; sepals about ¼ inch long, lanceolate, elongated; petals white, about ¼ inch long, erect; stamens numerous erect, somewhat incurved; pistils many; fruit red, hemispheric, about ½ inch in diameter, slightly hairy, the drupelets cohering.

The range of this species is from eastern Oregon and Washington to northern Idaho and western Montana. It occurs along streams and in moist soil.

It was first collected by Leiberg in wet meadows along the St. Mary's River in Idaho and appears to be very similar to *R. viburnifolius* (Greene) Rydb., discovered in the Selkirks by Shaw in 1904, from which it is separated, according to the *North American Flora,* by being less bristly and less strongly veined and folded in the bud, features which doubtless are subject to a wide range of variation.

5. **Rubus laciniàtus** Willd.

Evergreen Blackberry

Rising 3 to 6 feet from the ground, with long, straggling branches 10 to 15 feet in length, living two years or longer, purple, angled, armed with flat, hooked prickles, when young hairy, but becoming smooth with age; leaves divided into 5 segments, those of the floral branches bearing 3 or fewer segments, the terminal lobe of the leaf cordate, the later ones ovate, the margin cut into lobes and teeth of varying size and form, surface green and smooth above, prominently veined and hairy beneath; inflorescence terminal, often leafy, hairy and strongly prickly; sepals ovate or lanceolate, long-pointed, often lobed, densely hairy and reflexed; petals white or pinkish, obovate, about ⅜ inch in length; fruit black, globose, about ½ inch in diameter.

The Evergreen Blackberry has escaped from cultivation in various parts of the country from New York and Pennsylvania to British Columbia, Washington, and Oregon. It is a native of Europe. It occurs wild near Missoula, Montana, and probably in other places in the Rocky Mountains.

RÒSA

Rose

The roses are shrubs of medium height, with more or less bristly or prickly stems. The leaves are alternate in position, pinnately compound, with usually prominent stipules, the leaflets normally with serrate or dentate margins. The flowers are showy, solitary or clustered, on short, leafy branches. The floral peduncle is dilated at its summit into an oval or globular receptacle, which narrows at the top and bears on its margin sepals, petals, and stamens. The sepals and petals are each usually 5 in number, the former green, more or less elongated, the latter, in the wild species of this region, red and contracted at the base into a short stalk or claw. The stamens, indefinite in number, are inserted in whorls around the margin of a glandular disk which lines the inside of the receptacle. Each stamen is composed of a slender free filament, bent inward or crumpled in the bud, and an anther facing inward and opening lengthwise to release the pollen. The many carpels are free from one another, seated on the floor and sides of the receptacle, each with a small, one-seeded ovary and a slender style, which extends upward through the mouth of the receptacle and ends in a small, dilated stigma. The disk and pistils are usually covered with hairs. All the stigmas are about uniformly elevated above the mouth of the receptacle and below and surrounded by the anthers. Inside the ovary and attached along its inner angle toward the center of the flower is attached a single ovule, sometimes accompanied by the trace of a second. The fruit consists of the ripened carpels and the receptacle, which becomes fleshy and colored. The pistils ripen as achenes, enclosed within the pulpy receptacle, but not laterally connected with it.

This is a large genus, the number of species being variously regarded. One author described over four thousand from Europe and western Asia alone, but the majority of botanists recognize over one hundred species. One American author describes one hundred and twenty-nine species for North America and thirty for the Rocky Mountains. The genus is very widely distributed throughout the Northern Hemisphere, extending from the colder latitudes south to New Mexico, India, and northern Africa. We may clearly recognize ten species in the northern Rocky Mountains.

Roses have in all times been plants of great interest, as indicated in the literature of all periods, especially among the Aryan peoples. Their importance is chiefly in the ornamental uses which they serve. In this respect they have been much sought and cultivated. Many exotic forms have been introduced into this country, and the number of horticultural varieties is very large. They hybridize freely, and many intermediate forms in the field are interpreted as crosses.

KEY TO THE SPECIES OF ROSA

- Sepals persistent on the ripening fruit
  - Infra-stipular spines wanting
    - Leaves smooth on both sides...................... 1. *R. arkansana*
    - Leaves densely hairy beneath...................... 2. *R. acicularis*
  - Infra-stipular spines usually present
    - Flowers usually solitary
      - Receptacle bristly .... 3. *R. MacDougalii*
      - Receptacle not bristly
        - Prickles stout .... 4. *R. nutkana*
        - Prickles slender .... 5. *R. Woodsii*
    - Flowers usually clustered
      - Stipules, petiole, and midrib distinctly glandular 6. *R. Fendleri*
      - Stipules, petiole, and midrib not very glandular
        - Receptacle globose, without neck
          - Sepals very glandular.................. 7. *R. pisocarpa*
          - Sepals not very glandular............... 8. *R. ultramontana*
        - Receptacle pyriform, with neck............ 9. *R. pyrifera*
- Sepals deciduous from the ripening fruit................ 10. *R. gymnocarpa*

1. **Rosa arkansàna** Porter

Arkansas Rose

A low shrub, less than 2 feet in height, stems stout, smooth, covered with a bloom, armed with weak, deciduous bristles; leaves divided into 9 to 11 oblong or ovate leaflets, which are about 1 inch long, varying from acute to rounded at the base and apex, the margin sharply serrate, the surface smooth above, more or less pubescent beneath, petiole and midrib as well as the stipules minutely glandular and somewhat pubescent; flowers 2 inches or more broad, numerous or several in clusters at or near the end of the branch, the pedicels and receptacles smooth, covered with a bluish bloom, the latter nearly spherical; sepals ovate, prolonged into a somewhat broadened tip, glandular and pubescent on the margins; petals broadly obcordate, longer than the sepals; styles distinct, persistent, not extending much beyond the mouth of the receptacle; fruit ½ inch or less in diameter, the persistent sepals somewhat reflexed.

This species is found from Colorado northward into British America and northeastward into the plains of the Missouri and the Saskatchewan. In Montana it grows near Bozeman and Red Lodge and on the Yellowstone River and Frenchman's and Nevada creeks.

The description of *Rosa arkansana* was written by Porter in 1874 from material collected near Canyon City, Colorado. An earlier record of apparently the same plant was made by Borrer in Hooker's *Flora* in 1832. Within recent years, however, various conceptions of the species have been presented and several specific and varietal descriptions have been published, based upon various forms. The most recent treatment of the case (Rydberg, *North American Flora,* 1918) restricts the conception of *R. arkansana* to the forms with more pubescent leaves, ranging eastward from Colorado, and follows Greene in applying the name *R. suffulta* to the smoother forms found in the Rocky Mountains northward. The view here presented follows the more conservative authors in including both forms under *R. arkansana* Porter.

2. **Rosa aciculàris** Lindl.

Prickly Rose

Stems 3 to 8 feet high, reddish-brown, thickly beset with straight, slender bristles and prickles of varying lengths, usually without the paired prickles below the leaves; leaves usually divided into 5 elliptic or oval segments, ½ to 1½ inches long, acute at the apex, as a rule rounded at the base, margin regularly serrate, entire toward the base, green and smooth above, beneath paler and bearing small glands among more or less abundant hairs; petiole and midrib pubescent and glandular; stipules wide, ½ inch or more in length, pubescent and glandular on the margins and back; flowers usually solitary, 2 inches or more broad, pedicel and receptacle usually smooth, the latter pear-shaped or oval, sepals nearly 1 inch long, lanceolate, broadened at the tips, white with matted hairs on the margin and within; petals obcordate, an inch or less long; styles distinct, not much exceeding the receptacle; fruit about ½ inch in diameter, somewhat shorter than broad, with short neck and persistent sepals, erect.

The range of *Rosa acicularis* extends across the continent from New York to Alaska and even into Siberia. In the Rocky Mountains it is found as far south as Colorado and occurs at altitudes up to 8,000 feet. In Montana it has been collected at Helena and Bozeman, in the Belt and Bridger Mountains, at Spanish Basin, and in Madison County. In Yellowstone Park it is found at Mammoth Hot Springs, and in the Canadian Rockies from the Mackenzie to the Saskatchewan.

The original collection was made in Siberia and described by Lindly in 1820. The same species seems to have been collected on Long's expedition to Winnipeg and named *R. Sayi* by Schweinitz in 1825 and again by Watson *R. Engelmannii* in 1887. Crepin in 1876 recognized a variety of *R. acicularis* under the name *Bourgeauiana,* which has since been published by Rydberg as a species, based mainly on the form of the receptacle, which in *R. Bourgeauiana* is said to be nearly globular. Another rose, very similar except for its ovate leaflets, was collected by Butler at Helena in 1908 and described by Rydberg in the North American *Flora* as *R. Butleri.*

3. **Rosa MacDougalii** Holz.

Prickly-fruited Rose

Erect shrub, 3 to 6 feet high, with brown, round stems and strong prickles in pairs below the leaves, and some scattered weaker prickles; leaves divided into 5 to 7 leaflets, each ½ to 2 inches long, broadly oval or elliptical, nearly acute at both ends or rounded at the base, rather regularly toothed, nearly smooth above and beneath; petioles somewhat hairy and glandular; stipules up to nearly 1 inch long, glandular and slightly pubescent; flowers solitary or rarely in small clusters, 2 to 3 inches broad, pedicel and receptacle covered with stiff, coarse hairs; sepals and petals about an inch long; fruit about ½ inch broad, globose, covered with bristly hairs.

The range of this species is from northern Utah through Idaho and western Montana to Washington and British Columbia. In Montana it is found in the Bitterroot Valley and is reported from as far east as Bozeman.

The species was described by Holzinger in 1896 from material collected in Idaho. The strongly hispid character of the pedicels, the flowers, and the fruit make rather striking features by which the plant may be distinguished. In all other respects it bears a strong resemblance to *R. nutkana,* and some authors have considered it merely a variety of that species (*R. nutkana hispida* Fernald and *R. nutkana MacDougalii* Piper). Holzinger, however, in his original description denies the presence of the paired spines below the leaves, on the presence of which most later authors seem to agree.

4. **Rosa nutkàna** Presl

Nootka Rose. FIG. 37

From 1 to 10 feet high, armed with stout, straight, or recurved prickles, usually a pair below each leaf, the branches sometimes unarmed and the young shoots prickly, flowering shoots usually glabrous; leaves compound by division into 5 to 7 segments, rarely 9, the terminal ½ to 2 inches long, broadly oval or elliptical, usually rounded at both ends or acute at the apex, serrate with sharp teeth diminishing toward the base, each tooth provided with minute secondary serratures with glandular points, mostly smooth on both sides, but rarely slightly pubescent beneath on the veins and slightly glandular, dark green above and somewhat paler beneath; petiole and midrib of the leaf glandular and pubescent; stipules ½ to ¾ inch long, dilated, mostly smooth, glandular-dentate on the margin, the free portion ovate, pointed; flowers mostly solitary, 2 to 3 inches broad, pedicel and receptacle usually smooth; sepals an inch, more or less, long, lanceolate, the point expanded into a foliaceous appendage, on the inner surface and margins white with matted hairs, on the back smooth, petals broadly obovate, an inch or more long; styles with summits only exposed above the rim of the receptacle; fruit nearly spherical, not contracted into a neck below the sepals, about ½ inch in diameter, smooth.

Rosa nutkana is found from Alaska along the coast to California and ranging eastward to the Rocky Mountains in the Canadian Rockies, Montana, Idaho, and Utah. In Idaho it is reported from near Boise, Lake Waha, and the Clearwater; in Montana, from Bozeman, South Fork of the Judith, Park County, and Flathead Lake; in

British America, from the coast to the Mackenzie River and some points eastward.

It was first collected by Menzies on Vancouver's voyage along the Alaska coast and later by others on Nootka Sound, whence it takes its name, and was described by Presl in 1851. The variations in leaf characters and armament have resulted in more or less pronounced forms, which have from time to time prompted the description of additional species. The description of *Rosa nutkana* was, according to Watson, established upon a comparatively glabrous form. Extreme departures from the type have furnished the basis for the descriptions of *R. Durandii* Crep., *MacDougalii* Holz., *muriculata* Greene, *Spaldingii* Crep., etc. *R. muriculata* (*R. nutkana glandulosa* Crep.) was founded mainly on the more glandular character of the leaves and the presence of numerous minute hard processes, whence the name.

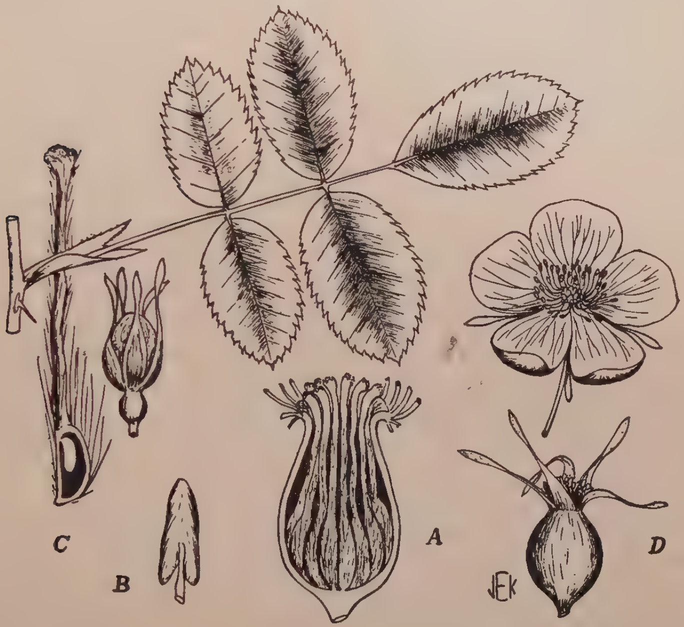

Fig. 37.—*Rosa nutkana* Presl. Nootka Rose

Leaf, flower, and flower bud, about two-thirds natural size; *A,* section through the receptacle of the flower, and *B,* anther, ×4; *C,* pistil, ×8; *D,* fruit, natural size.

5. **Rosa Woòdsii** Lindl.

Wood's Rose

A shrub usually under 3 feet in height, with reddish-brown twigs and slender straight or slightly recurved spines, usually less than ⅓ inch long; infra-stipular spines usually present, other prickles variable either numerous or scattered, or wholly wanting above; leaves bearing 5 to 7 leaflets, sometimes 9, the terminal rarely more than 1 inch long, commonly much less, all usually obovate in form but varying to oblong and lanceolate, rounded or pointed at the apex, wedge-shaped at the base, the upper margin serrate, the lower entire, both surfaces usually smooth but sometimes pubescent or glaucous beneath, borne on distinct, short stalks; petiole and midrib of the leaf smooth or with a few stalked glands or prickles; stipules narrow, free from the petiole only at the top, which is lanceolate, more or less toothed, usually smooth or sometimes glandular; flowers up to 2 inches broad, seldom in clusters, on short naked pedicels; receptacle globose, smooth, sepals ½ inch or more long extended into a flat appendage, smooth on the back or with a few stalked glands, white-woolly on the margin and inner surface; petals obcordate, about ¾ inch long; styles scarcely projecting beyond the mouth of the receptacle, fruit ⅓ inch or more thick, with short neck, the persistent sepals erect.

The range of *Rosa Woodsii* is from Saskatchewan to Kansas over the Great Plains and west to the Rocky Mountains from Utah to British Columbia. In Montana it is reported from Bozeman, White Sulphur Springs, Missoula, Great Falls, Miles City, Bitterroot Valley, Snowy Mountains, Beaverhead County, etc.; in Idaho, from Owyhee and Nez Perce counties, and in British America at Bear Lake, Saskatchewan, and Banff.

It was first collected on the Missouri River and described by Lindly in 1820. It has also been known as *Rosa Maximiliani* Nees and *R. Sandbergii* Greene. A species named *R. Macounii* by Greene bears a close resemblance to *R. Woodsii* Lindl. and by some authors is included in the description of that species; by others, however, it is separated, largely upon the basis of the pubescence and glands of the leaves and stipules.

6. **Rosa Féndleri** Crep.

Fendler's Rose

Stems 3 to 8 feet tall, with rather slender, straight or recurved spines, often scattered or none; leaves divided into 5 to 7 leaflets which are oblong or obovate, rounded at the apex, usually wedge-shaped at the base, ½ to 1½ inches long, sharply serrate, especially toward the apex, the surface usually glaucous, very finely hairy beneath or glabrous or somewhat resinous; petiole and midrib pubescent and prickly; stipules narrow, usually naked, sometimes glandular and ciliate on the margins; flowers usually less than 2 inches broad, solitary or few in a terminal cluster, the pedicels, receptacles, and sepals smooth; sepals lanceolate, extended into an appendage; petals obcordate, little more than ½ inch long; style distinct and not projecting much from the mouth of the receptacle; fruit nearly spherical or broadly ovate, without a distinct neck, about ⅓ inch in diameter.

Throughout the Rocky Mountains from British America to Texas and west to the Cascades and Sierras. In Montana it has been found in Madison County, near Gallatin City, in the Bitterroot Valley, etc.

The species was published by Crepin in 1876 from material collected in New Mexico.

7. **Rosa pisocàrpa** Gray

Pea Rose

A shrub, 3 to 6 feet high, with dark-colored stems and straight, slender, weak infra-stipular spines, prickles scattered or wanting; leaves usually bearing 7 leaflets, which are ½ to 1½ inches long, oval, nearly or quite rounded at the apex and base, serrate toward the base, smooth and green above, finely and densely hairy beneath; petioles and midrib pubescent; stipules on the lower leaves narrow, on the upper dilated, free only in the upper part, which is semi-lunar, taper-pointed, slightly glandular-toothed, the surface densely hairy; flowers in terminal clusters at the ends of short shoots, conspicuously leafy-bracted, the pedicels smooth, slender; receptacle globose, smooth, with short neck or none; sepals lanceolate, extended into a flattened point, ½ inch or more long, rough, glandular on the back, white-hairy within and on the margins; petals obcordate, about as long as the sepals; styles not united nor extending much beyond the mouth of the receptacle; fruit about the size of a pea, hence the name; persistent sepals erect.

The range of this species is from British Columbia to Idaho and California. It is reported from Nampa Canyon, Idaho.

It was first collected in Oregon and described by Gray in 1872.

8. **Rosa ultramontàna** Heller

A tall shrub, 3 to 9 feet high, with round, chestnut-brown twigs, armed with short, straight prickles, which are somewhat flattened to the base, flower-bearing branches often unarmed; leaves bearing usually about 7 leaflets, 1½ inches long or less, oval, rounded at both ends, margin serrate, the upper surface firm and smooth, the lower slightly pubescent, both dull green; stipules narrow on the lower leaves, on the upper wider, usually bearing small teeth, flowers usually in leafy-bracted clusters, with short smooth pedicels; receptacle smooth, bearing at its summit the lanceolate sepals extended into a blade-like appendage, smooth or slightly hairy, but not glandular on the back, hairy on the inside and the margins, about ½ inch or more long; petals about equaling the sepals in length, obcordate; styles distinct, not extending much beyond the mouth of the receptacle; fruit about ⅜ inch thick, globose, the persistent sepals erect.

This species is found from Montana to British Columbia and California, mostly in the interior.

9. **Rosa pyrífera** Rydb.

A shrub 3 feet or more in height, the brown twigs bearing straight, slender prickles sometimes ⅛ inch long; leaves divided into about 7 leaflets, which are about 1 inch in length, coarsely serrate, dark green and smooth above, finely hairy and more or less glandular beneath; petiole and midrib similarly pubescent and glandular; lower stipules narrow, the upper wider, finely hairy and usually glandular on the back, flowers about 2 inches wide, in clusters, on short, smooth pedicels; receptacle pear-shaped or ellipsoid, pointed at the base and narrowed into a distinct neck above; sepals nearly 1 inch long, lanceolate, produced into a flattened tip, more or less glandular on the back, hairy on the margins; petals obcordate, about as long as the sepals; styles not united nor extending far beyond the mouth of the receptacle; fruit pear-shaped, smooth, ¼ or more longer than broad, the persistent sepals erect.

The range of *R. pyrifera* is from Montana to Wyoming, Utah, and eastern California. It was first collected on the shores of Lake Pend d'Oreille in Idaho.

10. **Rosa gymnocàrpa** Nutt.

Bare-fruited Rose

A shrub 2 to 10 feet high, with rather slender branches, brown or purplish, and covered more or less abundantly with straight, slender prickles of varying length, the infra-stipular spines slender, ⅛ inch or less long, the floral branches prickly or unarmed; leaves bearing 5 to 9 leaflets, which are usually small, but vary from ⅛ inch to 1½ inches long, from nearly round to elliptic, the margin densely serrate with fine, gland-tipped teeth, smooth on both sides, thin and shining above, dull beneath and netted with semi-transparent veins; petiole and midrib more or less glandular and rough; stipules sometimes ½ inch or more long, the lower narrow, the upper wider, smooth on the back but glandular hairy on the margins; flowers small, usually solitary, on slender, smooth or rough glandular pedicels; receptacle ellipsoid, smooth; sepals ovate, pointed, usually without the terminal appendage, ¼ to ⅛ inch long, smooth on the back, hairy on the margins and within; petals about ½ inch long, obcordate; styles distinct, few; fruit less than ⅛ inch long, about ⅛ longer than thick, or almost spherical, the calyx deciduous at the neck of the receptacle.

The range of this species is from Montana to British Columbia and California. In Montana the following localities may be mentioned, Columbia Falls, Flathead Lake, and the Bitterroot Valley; in Idaho, Nez Perce County and the Coeur d'Alene Mountains.

It was collected first in Oregon, where it is said to be common in shady woods, and was described by Nuttall in 1840. Variations of this species were described by Greene in 1912 under the names *R. abietorum* and *R. glaucodermis.* Another form described by Greene as *R. leucopsis* is doubtfully separate from *R. gymnocarpa,* but is said to have longer sepals and thinner and less reticulately veined leaves. Probably this is not common in our range.

POMÀCEAE

Apple Family

The members of the Apple Family are trees or shrubs with alternate, petioled, pinnately veined or compound leaves, with small deciduous stipules. The flowers, usually borne in racemes or cymes, are perfect and consist normally of from 1 to 5 carpels, numerous stamens, 5 petals, and 5 sepals. The structure of the flower is a matter of peculiar interest in comparison with other members of the Rose order. The receptacle is shaped like that of the roses, the petals, sepals, and stamens being borne on its margin in alternate series. The carpels grow from the bottom of the receptacle and are usually free from it above and from one another. Below, however, the carpels are sunk in the fleshy tissue of the torus and in some members of the family they become united laterally with one another. Each carpel, dorsally coherent with the receptacle, is ventrally narrowed to an angle in the axis of the flower where a suture is marked by a groove continuous with the erect style extending above the mouth of the receptacle and ending in a knob-like stigma. Within the interior angle of each carpel is the placenta, to which are attached 2 or more ovules. The basic plan of the flower is 5; while the sepals and petals retain this number almost invariably, the stamens and carpels fluctuate in number, the former in the simplest members being an evident multiple of 5 and the latter 5. In other members, however, the carpels are reduced in number and the stamens become irregular. A glandular, nectariferous disk lines the upper part of the receptacle between the insertion of carpels and stamens. The petals are narrowed abruptly into a stalk or claw and are deciduous early, but the sepals have broad bases and remain persistent upon the matured fruit. The fruit is formed by the fleshy development of the torus or receptacle, surrounding the carpels and united to them, in this respect differing from the roses, in which the carpels are attached to the receptacle only at their bases. The wall of the carpel forms a parchment-like envelope surrounding the seed cavities and enclosed by the pulp of the receptacle and coherent with it.

The *Pomaceae,* so called because of the apple-like fruits or pomes which they produce, includes about twenty genera and numerous species of wide geographic distribution, chiefly, however, through the North Temperate Zone. In the northern Rocky Mountains three genera may be recognized and, according to some authors, about fourteen species. They are less abundantly represented in the Rocky Mountains than in the coast regions on the west and the Mississippi Valley and Atlantic states to the east.

The biological features of the group present certain points of interest. The nectar-bearing flowers are freely visited by bees and other insects. Whether through the facility of crossing or owing to other influences, the great variability within some genera of the family offers serious obstacles to the satisfactory classification of the species. The fleshy edible fruits of most members of the group are much sought by birds and other animals, which has led no doubt to the wide dispersal and common occurrence of these species.

The members of the Apple Family are among the most useful and widely cultivated plants. The apples, pears, and quinces are too well known to need comment. As in nature the attractive qualities of many species in flower and fruit make them conspicuous in any flora, so under the hand of the horticulturist they have yielded some of the most beautiful plants of parks and gardens. The hard and heavy wood has a minor value in its suitability for special purposes.

Key to the Genera

Leaves simple	
Thorns wanting, flowers in racemes	*Amelanchier*
Thorns present, flowers in cymes	*Crataegus*
Leaves compound	*Sorbus*

AMELÁNCHIER

Service Berry, Shadbush

The service berries are shrubs, seldom if ever trees in the Rocky Mountains. Buds of two kinds appear on the winter shoots, the fertile buds containing the rudiments of flowers for the next season, larger and more dilated, the vegetative smaller and narrower, containing leaf rudiments, plicately folded. The flowers, borne in erect or drooping racemes, stand on slender pedicels in the axils of narrow and early deciduous bracts. The receptacle in the flower is approximately bell-shaped, but becomes spherical in fruit, the center occupied by 2 to 5 carpels, the margin by numerous stamens, 5 petals, and 5 sepals. The petals are white, narrow, and fall early. The sepals are green and remain attached to the receptacle. Within each ovary the two ovules attached to the placenta in the angle toward the axis of the flower become more or less completely separated by a false partition which arises between them and ultimately may divide the fruit into twice as many chambers as there are carpels. This feature, however, is quite variable and in many cases may be wanting. The fruit, ripening in summer, is small, berry-like, somewhat resembling a huckleberry.

Some authors recognize from twenty to twenty-five species of *Amelanchier* and one cites as many as fifteen belonging to the

Rockies. Considerable difference of opinion obtains, however, on the specific distinctions within the group, and a conservative estimate is safer, pending a thorough investigation. The genus is abundantly represented by one species or another throughout the whole temperate region of North America. In the Rocky Mountains of Montana it is especially common and in season conspicuous by reason of its showy white flowers, at lower and middle elevations.

The abundant and palatable fruits of the service berry have served as food for the Indians and early settlers of this region. For their fruits, but more especially for their profuse white flowers, several species have been introduced into cultivation (*Amelanchier laevis*).

The first reference to American Amelanchiers is found in Linnaeus' *Species Plantarum,* 1753, under the name *Mespilus Canadensis,* the service berry of the eastern states. The genus *Amelanchier* dates from a publication of Medicus in 1789.

KEY TO THE SPECIES OF AMELANCHIER

Receptacle and fruit more or less pubescent
  Leaves and inflorescence mostly smooth.................. 1. *A. alnifolia*
  Leaves and inflorescence hairy........................... 2. *A. oreophila*
Receptacle and fruit quite smooth.......................... 3. *A. Cusickii*

1. **Amelanchier alnifòlia** Nutt.

Service Berry. FIG. 38

A large shrub, at its maximum development reaching 30 feet in height, but in the Rocky Mountains much smaller, with slender, many-branched stems; bark on older stems gray, on young twigs reddish-brown, smooth, winter buds ¼ to ⅓ inch long, smooth, somewhat darker than the twigs; leaves 1 to 1½ inches long, broadly oval, ovate, or elliptic, the apex sometimes pointed, the base occasionally cordate, the margin serrate, especially above the middle, nearly or quite smooth on both sides even when young; flowers in rather dense racemes, which are 1 to 2 inches long, smooth; sepals sharp-pointed; petals oblanceolate or spatulate, about ½ to ¾ inch long; fruit ⅓ inch or less in diameter, purple, covered with a bluish bloom, juicy, sweet, and edible.

The distribution of this species extends from Nebraska to the Yukon and throughout the Rocky Mountains northward from Colorado. In Montana it is one of the commonest shrubs on flats and rocky slopes of the foothills. The following localities may be noted: Missoula, Deer Lodge, Helena, Bridger Mountains, and Bitterroot Valley; in the Canadian Rockies, at Laggan and at Tunnel Mountain.

A plant of this genus described by Lindly in 1833 under the name *Amelanchier florida* is by some authorities regarded as a distinct species, by others referred to *A. alnifolia.* It is difficult by comparison of published descriptions or material to find any significant difference between the two. With reference to *A. florida* some emphasis is laid upon the size of the petals, which is greater than that allowed for *A. alnifolia,* resulting in more showy flowers. Whether or not this is a consistent difference between the two should be made the subject of further study. Another species, *A. utahensis* Koehne (*A. alnifolia utahensis* Koehne) is sometimes cited as doubtfully distinct from *A. alnifolia,* but as this comes only into the southern part of Idaho it may hardly be considered as properly within our range. It is recognized by its smaller grayish leaves, flowers and fruit, and its narrow sepals pubescent on both sides.

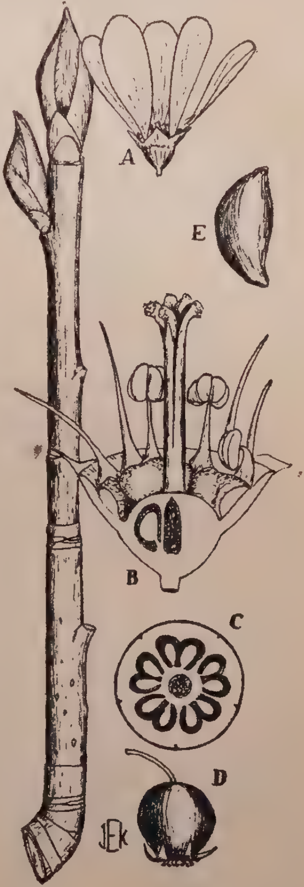

Fig. 38.
Amelanchier alnifolia Nutt.
Service Berry

Twig, winter condition, ×2; *A,* flower, natural size; *B,* vertical section through same, ×6; *C,* transverse section through ovary of flower, ×8; *D,* fruit, natural size; *E,* seed, ×4.

2. Amelanchier oreòphila Nels.

A low, scraggy-branched shrub, usually less than 6 feet in height, growing mostly in close clumps, twigs more or less pubescent; leaves not more than 1½ inches long, ovate, obovate, or broadly elliptic, rounded or obtuse at the apex, serrately toothed from the middle upward, pubescent on both sides with more or less persistent, long, gray hairs; petioles less than half as long as the blade, similarly pubescent; stipules linear, brown, pubescent, and deciduous;

inflorescence rather short and dense; receptacle and calyx hairy, the latter sharp-pointed, triangular; petals spatulate or oblanceolate, about ⅓ inch long; fruit pubescent or smooth, globose, dark purple, rather dry and with little pulp, maturing late.

This species is found from Montana and Idaho to Nevada and New Mexico in the Rocky Mountains, occupying open stony slopes, more or less mixed with *A. alnifolia.* In Idaho it is found at Montpelier, in Montana at Missoula.

This was formerly included under *A. alnifolia* but was separated as a species by Nelson in 1905, who says: "After many years observation in the field and the study of a large series of specimens, I am satisfied that two valid species exist and can be readily distinguished. Nuttall's *A. alnifolia* is the widely distributed, glabrous shrub of the creek banks, moist canyons, and snow slopes. At maturity it is perfectly glabrous. . . . . *A. óreophila* is a smaller shrub, scraggy-branched, usually in dense clumps, and occurring in the driest situations (open stony slopes, ridges, and hill-tops). It is never wholly glabrous. . . . ."

3. **Amelanchier Cusíckii** Fernald

A shrub, 6 to 15 feet high, with smooth, reddish bark, leaves 1 to 1½ inches long, ovate or oblong, rounded at the apex or the smaller sharp-pointed, serrate with rather coarse teeth to near the base; inflorescence bearing about 6 flowers; receptacle smooth, sepals lanceolate, sharp-pointed, sparingly hairy within; fruit smooth, dark purple or black when fully mature, about ⅜ inch in diameter.

The range of this species is from British Columbia to Oregon and Montana; it is reported from Emerald Lake in the Canadian Rockies.

CRATAÈGUS

HAWTHORN

The hawthorns are small trees or shrubs with widely forking, stiff branches armed with strong thorns. The leaves are petioled, alternate, serrate-lobed or cut into pinnate divisions. Flowers are borne in terminal, broad clusters, white, and conspicuous in season both for color and for fragrance. The receptacle of the flower is cup- or bell-shaped, bearing on its margin, 5 sepals, 5 petals, and an indefinite number of stamens. In the bottom of the concave receptacle are embedded 1 to 5 carpels, each as a rule bearing 1 ovule. The fruit resembles a small apple, externally fleshy, red or purple, bearing at its summit the persistent calyx, internally furnished with 1 to 5 bony carpels, each containing a single seed.

About nine hundred species of *Crataegus* have been described from North America, while about sixty are known from the Old World. So fluctuating and unstable are the characters upon which many of the species are established that little certainty at present obtains as to the identity of many forms. However, some more or less clearly marked species can be recognized. The number at present known from the Rocky Mountains is only about eight, and of these but four or five are reported from the northern ranges.

In the Rocky Mountains the hawthorns are found along stream bottoms and low hillsides or other situations at moderate elevations where at least a fair amount of moisture is available in the soil. They are rather sparingly distributed as compared with the service berries. The flowers are visited by many insects and the small fruits furnish food for various animals, which assist in the dispersal of the species.

The plants of this genus have few uses. The hard, strong wood is suited to a limited range of utility, owing probably to the small quantity and poor form in which it can be obtained. The fruits are sometimes used as food by Indians and early settlers, where better products are not obtainable. Owing to the highly ornamental qualities of flower and fruit of many of the species, there are numerous forms in cultivation in parks and gardens, and a number of beautiful hybrids are well known.

Key to the Species of Crataegus

Spines mostly 1 to 1½ inches long	
Leaf-blades almost as broad as long	1. *C. Douglasii*
Leaf-blades half as broad as long	2. *C. rivularis*
Spines mostly over 1½ inches long	
Teeth of leaves not gland-tipped	3. *C. succulenta*
Teeth of leaves gland-tipped	
Leaf-blades broad, nearly round	4. *C. chrysocarpa*
Leaf-blades narrower	
Leaves distinctly hairy	5. *C. columbiana*
Leaves scarcely hairy	6. *C. Williamsii*

1. **Crataegus Douglásii** Lindl.

Douglas Thorn. Fig. 39. Plates 23, 24

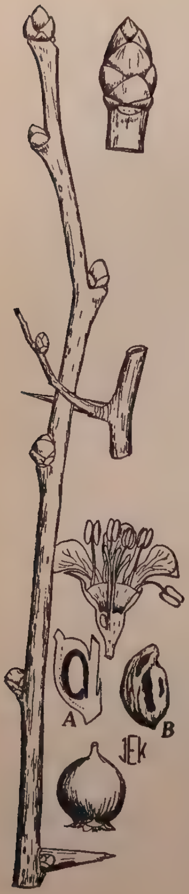

Fig. 39.—*Crataegus Douglasii* Lindl. Douglas Thorn

Twigs natural size; bud, ×2; flower, ×2; fruit natural size; *A*, vertical section through carpel of flower, ×8; *B*, nutlet, ×2.

A tree, under most favorable conditions 30 to 40 feet high, sometimes nearly 2 feet in diameter, with stout, spreading or ascending branches, bark on older branches gray, on youngest twigs, brown, changing to gray; lenticels small, oval, sparse; spines appearing at the lower nodes of the season, as axillary branches, ½ to 1 inch long, bearing a lateral dormant bud at the base and usually vestiges of others higher up, dark, shining, and sharp. The lateral buds at the base of the spines later develop into short branches, which ultimately form flower buds in the axils of leaves on the first season's growth. Winter buds are broadly oval in form, a deep reddish-brown in color, blunt, the scales overlapping and showing 5 to 6 exposed. Young leaves are spirally arranged in the bud, and the flower rudiments laid down in the fall. Leaves 1 to 3 inches long, 1 to 2 inches wide, ovate or obovate in general outline, rounded or pointed at the apex, wedge-shaped at the base, serrately toothed toward the apex, usually somewhat cut into unequal lobes, these and the teeth tipped by minute glands, smooth at maturity but sometimes slightly hairy along the veins when young, dark green and shining above, paler beneath; petioles usually less than ½ inch long, often hairy, margined to some extent by the decurrent blade; flowers ½ inch or less broad, in flat or convex clusters, on slender pedicels; receptacle bell-shaped, smooth, the lobes of the calyx narrowed from the broad base, sharp-pointed, somewhat toothed and dark-pointed toward the apex, smooth on the outer, hairy on the inner side; petals round, about ⅛ inch or more wide; styles 2 to 5 surrounded by hairs at the base; fruit about ½ inch long, in compact clusters, short oval, cut square across the apex by the abscission of the calyx, dark purple with a bloom, flesh yellow, sweet.

The distribution of the Douglas Thorn extends from British Columbia to California through the

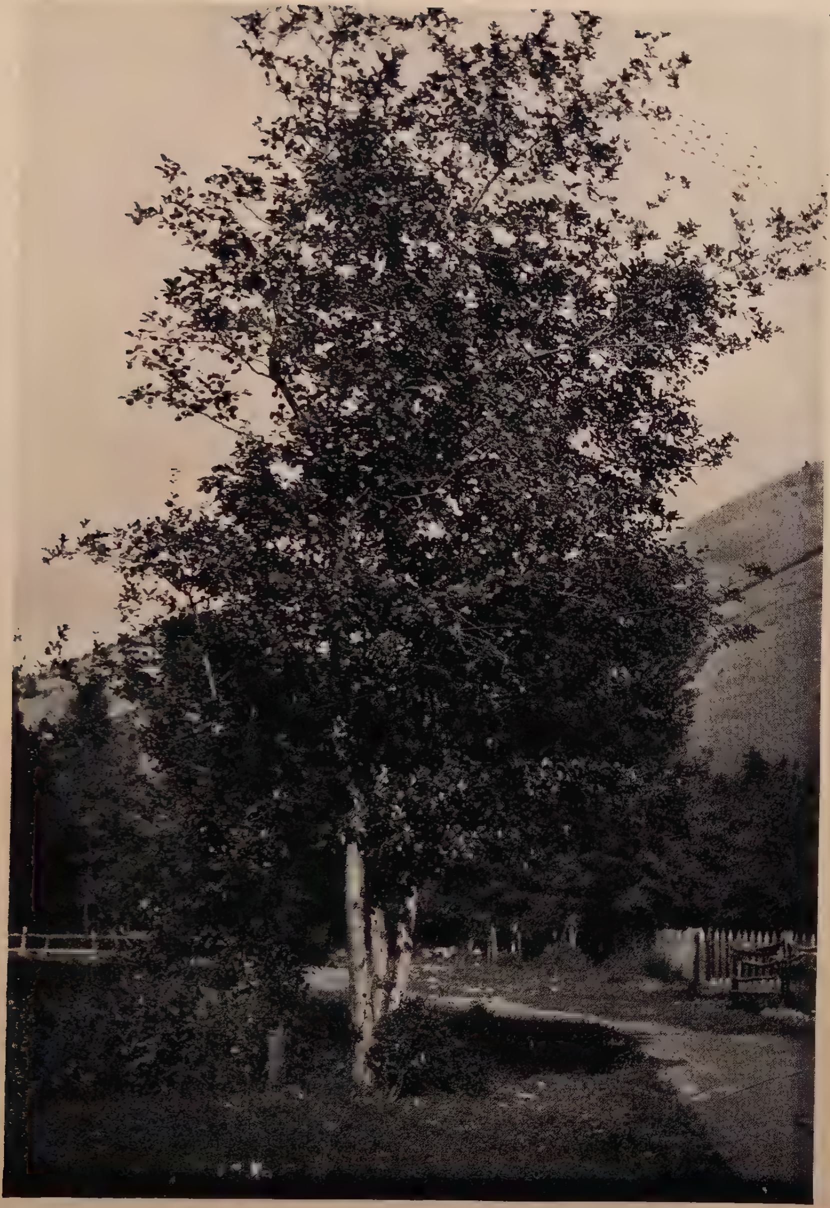

PLATE 23 (p. 192) *Crataegus Douglasii* Lindl.

Douglas Thorn from the vicinity of Missoula, Montana

coast states, eastward to the Rocky Mountains of Idaho, Montana, Wyoming, New Mexico, and Alberta, and across the northern plains to the shores of the Great Lakes. It is a very common species on the western slopes of the Rockies at ordinary elevations, along stream bottoms and on moist upland soil. In Idaho it is found in the Moscow Mountains and on the shores of Lake Pend d'Oreille; in Montana, at Bozeman, and in Lewis and Clark County, near Missoula, and in the Lolo Valley.

2. **Crataegus rivulàris** Nutt.

River Thorn

A low tree, sometimes 15 to 20 feet high, with dark brown, scaly bark, the slender branches forming an open crown, the shining, reddish-brown twigs marked by pale lenticels and armed with slender straight spines, an inch more or less in length; leaves about 2 inches long, ¾ inch wide, lanceolate or narrowly oblong-obovate, sharp or taper-pointed at the apex, wedge-shaped at the base, finely crenate-serrate above with glandular teeth, reddish when emerging from the bud, usually smooth or with some straggling hairs on the upper surface, dull green above, paler beneath, midribs yellowish, with a few distinct lateral veins; petioles slender, about ½ inch long, slightly winged toward the apex; the leaves on vigorous shoots may be diamond-shaped, cut into several shallow lobes and somewhat larger than the others, the petioles distinctly winged; flowers about ½ inch across, in compact rounded clusters; receptacle bell-shaped, smooth, the sepals linear, bearing early deciduous glands, smooth on the outer, sparingly hairy on the inner surface, often colored; petals round, crenate at the summit; stamens about 20, with pale yellow anthers; fruit in scant clusters, on dropping pedicels, short, oblong, rounded at the ends, dark red and marked by white dots when fully grown, ⅓ to ½ inch long; flesh dry and mealy.

This species is found in the Rocky Mountains of Colorado, Wyoming, Idaho, and probably Montana, where it has been reported from Red Lodge in the southern part of the state. In Idaho it has been collected at McCammon and elsewhere.

3. **Crataegus succulénta** Schrad.

Long-spined Thorn

A tree, 12 to 20 feet in height, with ascending and spreading branches, forming an open, wide crown, with gray bark and smooth, shining, chestnut-brown twigs, the younger branches bearing numerous smooth, brown spines, which sometimes reach 3 to 4 inches in length, on the youngest twigs often ¾ to 1¼ inches long, the youngest straight, the old thorns recurved and much sharper, in either case marked by a distinct collar at the base. The last season's growth on these shoots is marked by prominent buds above and a few thorns below; leaves 1 to 3 inches long, 1 to 2 inches wide, diamond-shaped or obovate, with sharp apex and broadly wedge-shaped base, doubly serrate toward the apex, dark green and shining above, paler beneath, leathery, slightly hairy above and beneath, especially along the veins; petioles slightly winged, less than 1 inch long; inflorescence bearing several or many flowers, each ½ inch or more broad, the pedicels hairy, receptacle hairy, short, the sepals lanceolate, sharp-pointed, bearing minute glandular teeth and hairy; petals ¼ inch or more broad; stamens 10 to 20, anthers usually pink; styles 2 to 4; fruit about ½ inch in diameter or less, more or less hairy, the calyx lobes reflexed, the flesh yellow, sweet, and pulpy.

The range of this species is understood to extend from the north Atlantic Coast of Nova Scotia and New England to North Carolina and west to the Rocky Mountains, in which it is found from Colorado northward to British America. In Montana it is reported from Bozeman, Great Falls, and Park County. It is usually found in the prairie regions but extends up the mountains to an altitude of 6,000 feet.

Here again considerable difference seems to obtain as to the identity of the species and others either closely related or the same. One author considers *Crataegus succulenta* Schrad. as essentially synonymous with *C. macrantha* Lodd., more common through the eastern states, *C. occidentalis* Britton, *C. coloradensis* Nels., *C. colorado* Ashe, and *C. coloradoides* Ram.

4. **Crataegus chrysocàrpa** Ashe

Golden-fruited Thorn

A small tree with a narrow crown and ascending branches, the twigs of the season somewhat hairy when young, becoming smooth, shining, red or brown the second year; armed with slightly recurved, slender, sharp, and numerous spines, 1½ to 2 inches long; winter buds nearly globose, smooth, dark and shining; leaves ordinarily 1 to 2 inches long, ¾ to 1½ inches wide, ovate, obovate or diamond-shaped, the apex acute or obtuse, the base varying from acute to broadly obtuse, the margin divided into 7 to 9 shallow, triangular lobes, which are again finely serrated, the teeth bearing glandular points, the sur-

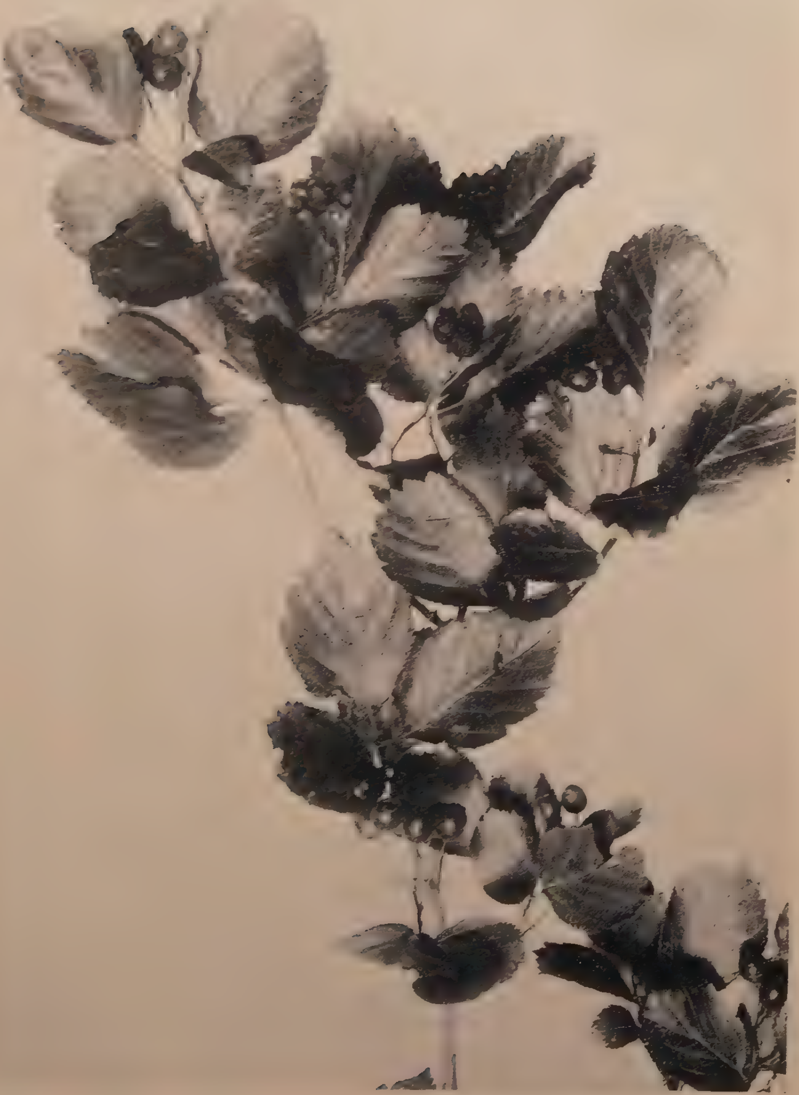

PLATE 24 (p.192) *Crataegus Douglasii* Lindl.

Douglas Thorn. Leaves and fruit in August, from Missoula, Montana

face at maturity quite hairless on both sides but when young covered with a sparse growth of rather long hairs, dark green above, paler beneath; petioles less than 1 inch long, narrowly winged, bearing a few glands, at first hairy but at length smooth; inflorescence often 2 inches or more broad, flat or slightly convex, its branches subdividing, hairy; receptacle bell-shaped, hairy, the lobes of the calyx lanceolate, pointed, hairy on the margins and back; petals about ¼ inch long, round or broadly oval; stamens 10, styles 3 to 4; fruit yellow, orange, or reddish, sometimes apparently varying to dark, broadly oval, about ⅜ inch long.

The range of *Crataegus chrysocarpa* extends along the Atlantic Coast from New Brunswick to North Carolina and west to the Rocky Mountains from New Mexico to Montana and probably Alberta. In Montana it occurs at Missoula.

The species was first brought to notice by Ashe, who described it in 1900, referring to a collection made by himself in the foothills of the Cache la Poudre Mountains in Colorado at an altitude of about 6,000 feet. The description as above written probably includes two or three others, which a less conservative view would assign to specific rank, viz., *C. Doddsii* Ram., *C. cerronis* Nels., and *C. Sheridana* Nels. In this most variable group it seems best to suspend judgment for a time upon the validity of these species. Whether or not, however, these should be regarded as synonyms, they are not of immediate concern to the student of the Rocky Mountain flora, since at the present information they hardly come within our range.

5. **Crataegus columbiàna** Howell

Howell's Thorn

A much-branched shrub or small tree, 6 to 15 feet high, with stout spines 1 to 2 inches long; leaves 1 to 2 inches or more in length, obovate, with broadly wedge-shaped base and pointed apex, the margin cut into 5 to 9 lobes above the middle, the lobes serrated, the teeth often tipped with glands, especially below, sparingly long-hairy, especially along the veins; petioles about ½ inch long, slightly furnished with long hairs, glandular and winged toward the apex; inflorescence usually many-flowered, its branches sparingly long-hairy or becoming smooth with age, the flowers usually over ½ inch broad; receptacle about as long as the sepals, which are triangular, long-pointed, and smooth on the outside, bearing a few long hairs on the inside and sparse, glandular teeth on the margin, and ending in a red tip; petals round, ⅛ inch or more long; stamens about 10; styles 3 to 4; fruit pear-shaped or oblong, ⅓ to ½ inch long, scarlet, the calyx lobes spreading, persistent.

This species is found from British Columbia to Oregon and east across the Rocky Mountains to North Dakota. It has been collected at Dixon, Montana.

Also known as *C. Piperi* Britton.

6. **Crataegus Williámsii** Eggl.

Williams' Thorn

A round-topped shrub or tree, up to 16 feet high, the branches bearing spines 1 to 2 inches long, the twigs smooth; leaves 1 to 3½ inches long, ¾ to 2 inches wide, ovate, sharp-pointed at the apex, often sharply wedge-shaped at the base, bearing 5 to 9 shallow lobes toward the apex, margin serrate with fine, gland-tipped teeth except toward the base, membranous, slightly appressed pubescent above, smooth below except along the midrib and at the junction of the veins; petioles ½ to 1¼ inches long, slightly winged above, somewhat hairy; inflorescence many-flowered, its branches hairy, the flowers ½ to ¾ inch broad; receptacle smooth; sepals nearly smooth outside, hairy inside, ovate, sharp-pointed, with occasional stalked glands; stamens about 10, styles usually 3 to 4; fruit globose, about ⅜ inch thick, red, slightly pubescent, the sepals reflexed, persistent.

As at present known, this species is found only in the Flathead Valley of western Montana, where it has been collected at several places, including Columbia Falls (where it was first found by R. S. Williams in 1892), Bigfork, Polson, and Ravalli.

It was described by Eggleston in 1909, who states that it is similar in leaf to *C. Douglasii,* but differs in having red instead of black fruit, and that it is more closely related to *C. columbiana* Howell, but has larger and less pubescent leaves, their tips and lobes less sharp, and larger fruit, which ripens about two weeks earlier than those of *C. columbiana* in the same locality.

SÓRBUS

MOUNTAIN ASH

The plants of this genus in our flora are small trees with pinnately compound, alternate leaves, and deciduous stipules. The flowers are borne in terminal flat-topped cymes, white and showy in season. The receptacle is urn-shaped, the margin bearing 5 sepals, 5 spreading, short-stalked, white petals, and an indefinite number of stamens. The number of carpels is usually 3, united to the enclosing receptacle, and bearing 2 ovules, each attached to the placenta situated in the interior angle toward the axis of the flower. The fruit is like a small apple, or berry-like, red, acid.

Species of *Sorbus* are found around the world in the Northern Hemisphere in the Temperate Zone. In all about eighty species have been described, though this number is doubtless subject to reduction. Only three are at present known in the Rocky Mountain flora. In this region they occur mostly on bottom lands or in moist soil at ordinary elevations.

The genus *Sorbus* dates from Linnaeus' *Species Plantarum,* 1753. Some of the species have long been known and cultivated, particularly the European Rowan, of which numerous horticultural varieties are now grown. Owing to their showy flowers and the colors of the foliage and the fruit they are much esteemed for ornamental planting. A few bear edible fruits and the wood has minor economic applications.

KEY TO THE SPECIES OF SORBUS

Leaflets serrate to the base............................... 1. *S. scopulina*
Leaflets serrate above the middle......................... 2. *S. occidentalis*

1. **Sorbus scopulìna** Greene

Mountain Ash. FIG. 40. PLATE 25

A shrub or small tree, 8 to 12 feet high, with rather thick, reddish branches and open crown, the young twigs at first gray and somewhat pubescent, later shedding the outer film and exposing the reddish-brown bark beneath, dark-colored about the leaf-scars; winter buds gummy, the terminal ½ to 1 inch long, the lateral ¼ inch or less, scales brown, hairy on the margins, but otherwise smooth; leaves 5 to 7 inches long, compound by division into 9 to 13 leaflets, which measure 1½ to 2 inches long and ½ inch or more in width, very sharp-pointed at the apex, rounded or wedge-shaped at the base, the margin cut into numerous, sharp-pointed, uniform serratures, both surfaces nearly or quite hairless, the midrib of the leaf especially when young showing a few hairs, at least near the junctions with the leaflets; petiole an inch or more long, with a few hairs near the base; stipules narrow, joined to the petiole, smooth and membranous; inflorescence 4 to 5 inches broad, flat-topped or slightly convex, the branches more or less hairy, flowers less than ½ inch broad; receptacle bell-shaped, slightly hairy; calyx lobes broadly ovate or triangular, with thin margins and dark tips, bearing a few hairs on the edges; petals round, ⅛ inch or more wide; stamens numerous; styles 3 to 5, hairy about the base; fruit ¼ inch or more in diameter, red, bitter.

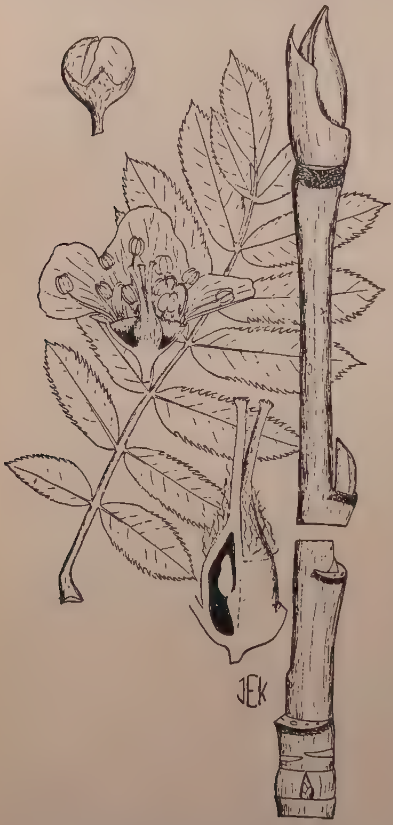

Fig. 40.—*Sorbus scopulina* Greene
Mountain Ash

Twig, in winter condition, natural size; leaf one-half natural size; bud and flower, ×2½; pistil in section, ×6.

The distribution of *Sorbus scopulina* is from British Columbia to Oregon and east to the Rocky Mountains in Alberta, in Montana, and south to New Mexico. In Montana it is found near Missoula, Helena, Bozeman, in the Bridger Mountains, and elsewhere; in Idaho, in the Coeur d'Alene Mountains, in Nez Perce and Elmore counties; in the Canadian Rockies, at Glacier and at Emerald Lake. It is a plant of the canyons and wooded hillsides in moist and cool situations.

In some books the species described as *Sorbus sambucifolia* Roem. or *Pyrus sambucifolia* Cham. and Schlect. are doubtless the same as *S. scopulina* Greene. The true *P. sambucifolia* of Chamisso and Schlectendahl is an Asiatic plant from Kamchatka, and by some authors is considered the same as the one described above. The description of the former species written in 1827 is hardly different from that which applies to *S. scopulina.* The latter designation was proposed by Greene in 1900. This seems to be not essentially distinct from *S. angustifolia* Rydb. or *P. sitchensis* Piper.

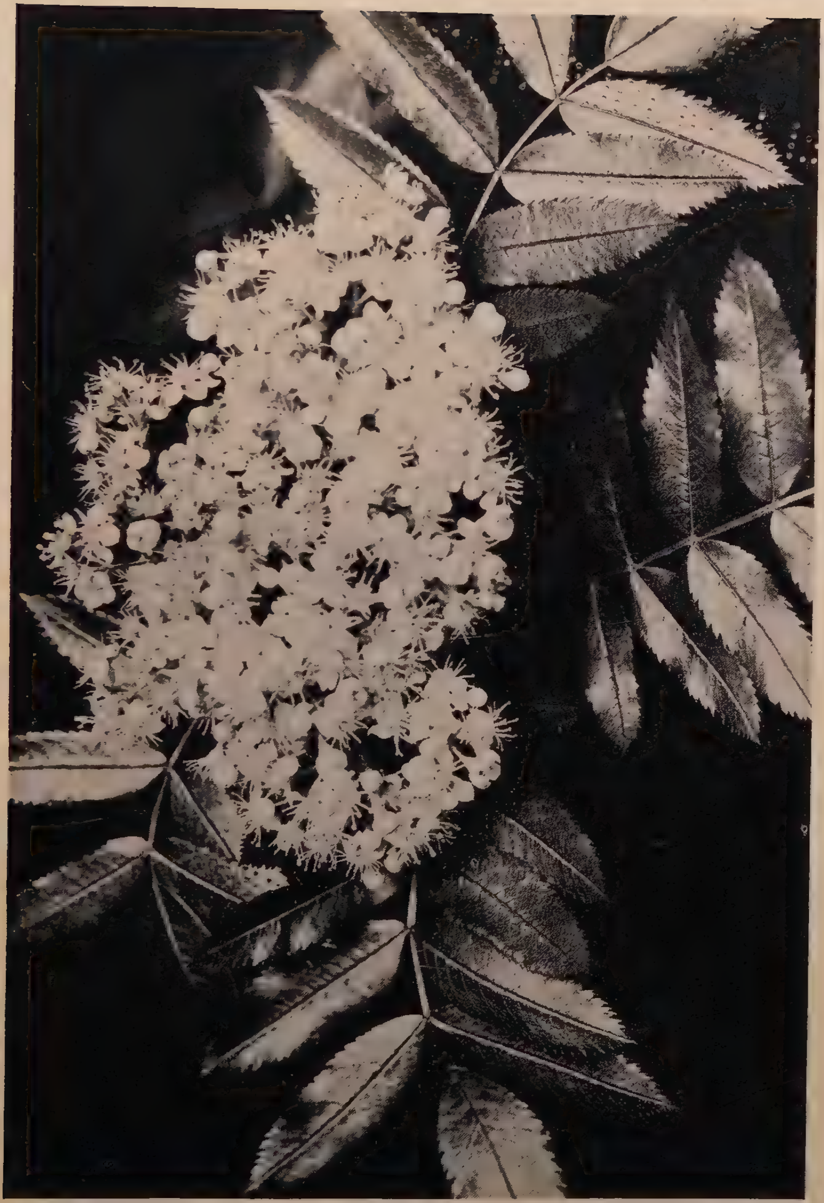

PLATE 25 (p. 197) *Sorbus scopulina* Greene

Mountain ash from the vicinity of Missoula, Montana

2. **Sorbus occidentális** Greene

Western Mountain Ash

A shrub, 3 to 9 feet high, with coarse, erect branches, the twigs and annual parts more or less finely hairy; leaves 4 to 5 inches long, compound by division into 7 to 13 leaflets, each from 1½ to 2 inches long, ½ inch or more wide, oblong-elliptical, obtuse or rounded at the apex, or ending in a short, sharp point, sharply or bluntly angled at the base, the margin usually toothed only near the apex or above the middle, both surfaces usually smooth; petioles an inch or two long, more or less hairy; stipules linear, tapering to a point, brown, membranous, ciliate on the margins; inflorescence a rounded cluster, 1 to 3 inches broad, its branches more or less hairy, flowers less than ½ inch broad; receptacle broadly bell-shaped to hemispherical, mostly smooth; sepals broad, triangular, with sharp-pointed lobes, smooth except on the margins; petals round, about ⅛ inch wide; stamens numerous; fruit red, broadly oval, about ⅛ inch long.

The range of *Sorbus occidentalis* is from Alaska to Oregon and east to the Yukon and the western slopes of the Rocky Mountains in Montana, usually at higher elevations.

The first collections of this plant came from the higher mountains of Oregon and Washington. It was collected by Greene on Mount Rainier in 1889.

DRUPÀCEAE

PLUM FAMILY

The members of this group are trees or shrubs, the bark exuding gum and producing prussic acid, which imparts a bitter taste to bark, leaves, and seeds. The leaves are simple, alternate, petioled, the small stipules falling early. Flowers are borne in racemes or umbels terminal on short twigs; they are perfect, bearing both stamens and pistils in the same flower. The concave receptacle bears 5 sepals, 5 white petals, and an indefinite number of stamens on its margin and a single carpel seated at the bottom of the concavity. The ovary contains a single chamber in which are 2 ovules, only one of which usually matures, attached to a placenta at one side where a suture extends lengthwise; the slender style which tops the ovary ends in a knob-like stigma. As the ovary begins to enlarge to form the fruit the receptacle parts at the base and falls off, carrying with it the calyx and other remnants of the flower. In this case also the structure of the flower may be compared to that of the rose, in which a number of pistils occupy the center of the receptacle, from which probably the single-carpeled flowers have been derived by reduction. In *Prunus triloba* and some abnormal flowers of other species several free carpels may be found. The fruit is of the sort known as a drupe, of which the common cherries and plums are familiar examples. The wall of the ovary becomes differentiated at maturity into two layers, an outer, pulpy, sometimes fibrous, exocarp, which in the cherry is the edible portion, and a hard, bony endocarp which invests the seed and is commonly known as the pit or stone. The seed-coats proper are a thin, brown, membranous film enclosing, in this case, an embryo having two large, fleshy cotyledons.

About one hundred and seventy-five species are at present known in this family of wide geographic distribution throughout the Northern Hemisphere, especially in the Temperate Zone, but extending also into the tropics. The genus is well represented in Asia. About a dozen species, according to some authors, appear in the Rocky Mountains, of which those described below may be found in the northern ranges at lower elevations. In our region the family is represented only by the genus *Prunus,* having the characters of the family. While the fruits are somewhat astringent, yet they are rich in food, and are eagerly sought out by many of our native birds.

The members of the *Drupaceae* are widely cultivated, mostly as orchard fruits, including the plums, prunes, cherries, apricots, peaches, almonds, etc., of which there are hundreds of horticultural varieties.

KEY TO THE SPECIES OF PRUNUS

Branches somewhat thorny (Plums)	1. *P. americana*
Branches unarmed (Cherries)	
Flowers in cylindrical clusters	2. *P. demissa*
Flowers in lateral, rounded clusters	
Leaves blunt or rounded at the apex	3. *P. emarginata*
Leaves taper-pointed at the apex	
Inflorescence not subtended by leaves	4. *P. pennsylvanica*
Inflorescence subtended by 1 or 2 leaves	5. *P. corymbulosa*

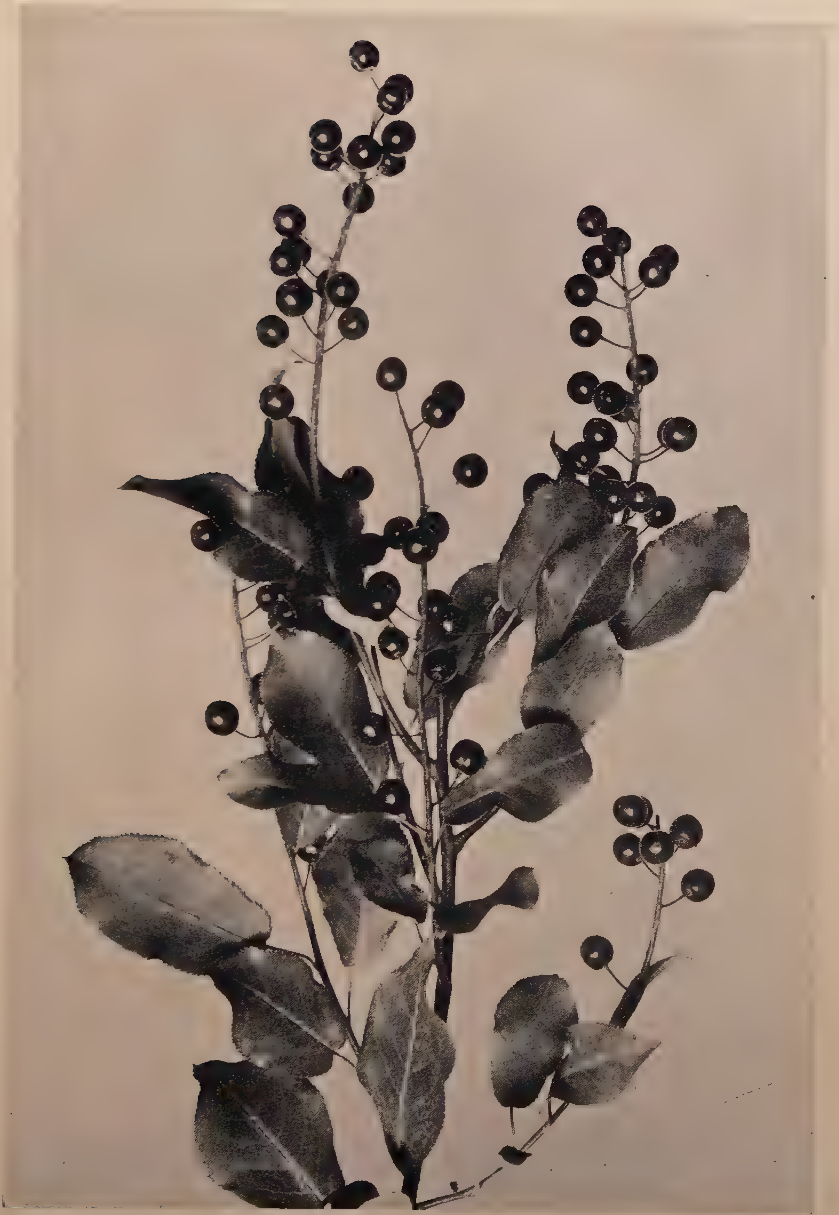

PLATE 26 (p. 201) *Prunus demissa* (Nutt.) Walp.

Chokecherry from the vicinity of Missoula, Montana

1. **Prunus americàna** Marsh

Wild Plum

A tree, reaching in the region of its development a height of 35 feet and a diameter of a foot, probably much smaller in the plains country, usually branching low and spreading, the twigs often pendulous, at first light green, smooth, or finely hairy, later becoming brown, the branches often armed with stout, spine-like spurs, the stem covered with a scaly bark about ½ inch thick; winter buds small, sharp-pointed, brown; leaves 2 to 4 inches long, 1 to 2 inches wide, mostly oval, taper-pointed at the apex, rounded or narrowed at the base, the margin as a rule uniformly serrate with sharp, fine teeth, when mature, thick, firm, hairless, dark green above, pale beneath; petioles less than 1 inch long, usually without glands; stipules narrow, bearing several teeth near the apex, early deciduous; flowers in small clusters, emerging from the winter buds with the unfolding of the leaves, strong-scented, about an inch broad, on slender pedicels about an inch long or less; receptacle narrowly bell-shaped, smooth, the sepals lanceolate, sharp-pointed, entire; petals round, somewhat ragged at the apex, inserted on the receptacle with a stalk or claw, colored below, ½ inch long or less, about half as broad as long; stamens numerous; fruit less than 1 inch in diameter, globular, yellow tinged with red, without bloom, the skin thick, the pulp yellow, juicy, acid; stone pointed, less than ¾ inch long, oval or nearly globular.

Among the several species of wild plum native to North America, this one has the widest distribution, being found on the Atlantic Coast from New York to Florida and west to Texas and the Rocky Mountains in Colorado and Montana and in British America east of the 100th meridian. In Montana it occupies the bottom lands of the Missouri and its tributaries, mostly in the plains region of the state. It is also found along the Flathead River and its tributaries.

The fruit of this tree is commonly used locally wherever it grows, and the tree is often planted for utility and ornament. Numerous varieties are propagated in horticulture. It was first described by Marshall in 1785.

2. **Prunus demíssa** (Nutt.) Walp.

Chokecherry. FIG. 41. PLATE 26

Usually a shrub but sometimes a small tree with thin, smooth or scaly, dark-red or brown bark; the main stems are mostly erect, the branches tapering into slender twigs, which are grayish- or reddish-

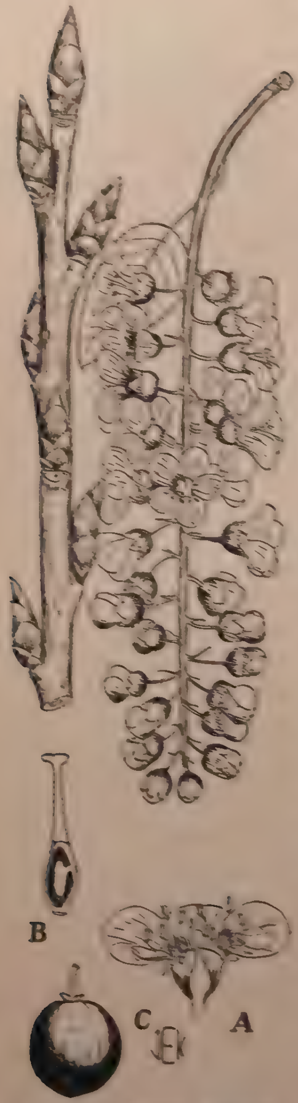

FIG. 41.—*Prunus demissa* (Nutt.) Walp. Chokecherry

Twig in inflorescence natural size; *A*, flower, ×2; *B*, pistil, ×5; *C*, fruit, natural size.

brown in the second season, marked by longitudinal lenticels, the young shoots of the season green, smooth or sometimes at first slightly hairy; winter buds usually sharp-pointed, with brown scales, more or less thin and colorless on the margins and rounded at the apex, often persisting for some time about the base of the season's growth as a thin, brown, membranous sheath; leaves 2 to 4 inches long, 1 to 2 inches wide, oval or ovate, sharp or abruptly taper-pointed at the apex, rounded or cordate at the base, the midrib appearing prominent and yellow on the lower side, the margin finely serrate with uniform, slender and callous teeth, both surfaces smooth or the lower sometimes bearing minute hairs, the whole blade thick, firm, dark green above, paler beneath; petiole slender, smooth, bearing near its summit a few distinct glands; inflorescence a cylindrical cluster 3 to 5 inches long, terminating a short, lateral, leafy shoot of the season, its axis and slender, lateral pedicels smooth, green, each subtended by a thin, early deciduous bract, the flowers half an inch or more broad; receptacle cup-shaped, smooth; sepals broad, smooth, the thin margin bearing minute teeth or a few small, dark-colored glands; petals round, short-stalked, usually about ⅛ inch long, falling early; stamens numerous; fruit ¼ to ½ inch in diameter, nearly spherical, black, smooth and lustrous and with a pleasant flavor, though slightly bitter; stone oval, about ¼ inch long.

The range of *Prunus demissa* extends from British Columbia to California and east to the Rocky Mountains from Alberta south to Arizona and Nevada, and across the northern plains to the Black

Hills. In Montana it is found at Chinook, Missoula, Lolo Hot Springs, and other places; in Idaho, at Moscow, Lewiston, and Pend d'Oreille Lake; in the Canadian Rockies, at Banff.

In western Montana this is one of the most common of the woody plants along streams and the low slopes of the foothills in open, sunny situations, often forming thickets and reaching a height of 10 to 20 feet. In thicket formation it is usually a shrub 8 to 10 feet high, and reaches larger dimensions as a tree in localities where moisture is more abundant both in soil and air. In the more humid regions of Oregon and Washington it may reach a height of 35 feet and a trunk diameter of 1 foot. The flowers appear in May (Missoula) and the fruit in August. Through the plains east of the mountains it is confined to the usual conditions for woody species, the stream bottoms or the higher mountain slopes.

Some authors see in the widest variants from the typical form of this species the justification for another specific distinction, expressed in the description of *P. melanocarpa* (A. Nels.) Rydb., which differs from *P. demissa* chiefly in a pubescence more or less evident on the lower sides of the leaves, and is usually regarded as being distributed southward beyond the range of *P. demissa,* which is hardly conceded to extend south of Idaho and Wyoming. Much of the material, however, from southern California, Nevada, Arizona, and New Mexico has the smooth and characteristic leaves of *P. demissa.* By most authors it seems to be considered the same as *P. demissa.*

Prunus demissa was first described by Nuttall as *Cerasus demissa* about 1840. His material came from the mouth of the Willamette River in Oregon.

3. **Prunus emarginàta** (Dougl.) Walp.

Bitter Cherry

A shrub in the Rocky Mountains, but in the regions of its best development reaching a height of 35 to 40 feet and a trunk diameter of a foot or more, the bark thin, smooth, dark brown on larger trunks, grayish brown on the smaller ones, the twigs of the season at first green, changing to red, those of the previous season straight, slender, stiff, gray or reddish-brown; winter buds small, sharp-pointed, the scales brown, colorless on the margins; leaves 1 to 3 inches long, ½ to 1½ inches wide, more often oblanceolate or obovate, the apex rounded or blunt, the base wedge-shaped and bearing one or more distinct glands, the margin divided into fine-pointed or rounded, more or less gland-bearing teeth, sometimes slightly pubescent on the lower surface, smooth and darker green above; petiole slender, ¼ to ½ inch long, slightly winged by the descending blade; inflorescence a few flowers in a rounded cluster, on nearly equal pedicels, emerging with the leaves from the winter buds, each slender, smooth pedicel subtended by a thin, colorless, toothed, and deciduous bract, the small flowers ⅓ to ½ inch broad; receptacle varying from hemispherical to bell-shaped, usually smooth, reddish-yellow within, sepals short, rounded at the apex, sometimes glandular on the margin, reflexed in the open flower; petals obovate, rounded or notched at the apex, contracted below into a short stalk, faintly tinged with green; stamens many; fruit ripening toward the middle or end of summer, ¼ to ½ inch in diameter, nearly black, smooth, and bitter; stone plump, oval, about ⅛ inch long.

The known range of *Prunus emarginata* is from British Columbia to southern California, east in the north to the Rocky mountains in western Montana, and in the south to Nevada and Arizona. In Idaho it has been collected in Latah and Kootenai counties. In Montana it appears in the upper Jocko valley and the Rattlesnake Valley near Missoula. It is rare in Montana.

This species was discovered by Douglas and described by him in 1832 as *Cerasus emarginata.* He found it along the upper Columbia, especially about Kettle Falls.

Another form of the Bitter Cherry known sometimes under the name of *P. prunifolia* (Greene) Shafer is distinguished by the pubescence on the leaves, young shoots, and inflorescence, but otherwise is hardly separable in the herbarium material from *P. emarginata.* This is also known as *P. emarginata* var. *mollis* Brew., as *P. mollis* Walp., or as *Cerasus mollis* Dougl. Its range is said to be from British Columbia to California and east to Idaho and Arizona. It apparently has not been observed in Montana.

4. **Prunus pennsylvànica** L.

Bird Cherry

A tree or shrub, reaching at most 30 to 40 feet in height and a trunk diameter of 15 to 20 inches, the crown usually narrow, more or less rounded above, the slender twigs red, smooth, or at first slightly pubescent with short hairs, covered with lenticels, the trunk covered with thin, dark red bark, separable in thin layers; leaves 3 to 4 inches long, ¾ to 1 inch or more wide, oblong or lanceolate, taper-pointed at the apex, sharp or rounded at the base, the margin finely and evenly serrate with incurved gland-tipped teeth, at maturity smooth, bright green and shining above, paler beneath; petioles less than 1 inch long, slender, smooth, sometimes glandular; inflorescence mostly of lateral clusters of few flowers, about ½ inch in diameter, on uniform, slender pedicels less than 1 inch long, appearing while the leaves are yet quite small; receptacle funnel-form, smooth, colored within near the border, the sepals blunt, red at the tips and reflexed when in flower; petals about ¼ inch long, nearly round, stalked at the base; stamens many; fruit ¼ inch in diameter, red, flesh thin and sour; stone pointed at the apex, rounded at the base.

The range of *P. pennsylvanica* is from Hudson Bay south to Tennessee and west through the Middle States and Mississippi Valley to the Rocky Mountains in Colorado, thence northward to the British possessions and westward to the Fraser Valley in British Columbia. In British America at Edmonton. In the Canadian Rockies it is described by Macoun as a small bush.

5. **Prunus corymbulòsa** Rydb.

A small shrub, 3 to 6 feet high, bark dark brown, shining; leaves 1½ to 2½ inches long, ovate or lanceolate, the apex sharp or taper-pointed, the margins finely serrulate, the surface smooth and shining; inflorescence of 3 to 6 flowers on pedicels usually subtended by 1 or 2 small leaves; sepals ragged on the margin; petals obovate, about ⅙ inch long, more or less pubescent; fruit nearly spherical, red.

This species is reported from the hills of Montana and Wyoming; in Montana from the Little Rocky Mountains, Bridger Mountains, and Columbia Falls.

From the scantiness of the literature pertaining to this plant, one may judge that it is either very rare or not very clearly differentiated in the matter of flower and leaf from other forms of the region, such as *P. pennsylvanica.* The fact that it is known only as a shrub is of little significance, since all the other species of the region are represented by many shrubby individuals. Rydberg cites this as equivalent to *Cerasus trichopetala* Greene, which Blankinship called *P. trichopetala.*

CELASTRÀCEAE

STAFF-TREE FAMILY

The plants of this group are trees or shrubs, some climbing by adventitious roots, others, exotic species, thorny. The leaves are simple, opposite or alternate, deciduous or evergreen. The flowers appear in loose, terminal clusters on lateral shoots, or more often solitary or in small groups in the axils of the leaves, the pedicels usually jointed, the sepals and petals equal and radially arranged and both stamens and pistils normally present. The flower contains a glandular disk, the margin of which is occupied by the stamens, the center by the pistil. The flowers are on the plan of 4 or 5, there being usually an equal number of sepals, petals, and stamens in alternating series. The pistil is made up of 2 to 5 carpels united into a common ovary, style, and stigma. The ovary, containing as many cells as there are carpels, may stand above and distinct from the disk or be united with it. Two or more ovules appear in each chamber of the ovary, attached to the axis. The fruit is a somewhat fleshy pod which opens to release the small seeds.

Forty or more genera are included in the *Celastraceae,* and upward of three hundred and fifty species are recognized. With the exception of the polar zones this family is world-wide in its distribution. Only five genera are known to occur in the Rocky Mountains and only one or two species of *Pachystima* are conspicuous in the flora of the northern ranges. *Celastrus* and *Euonymus* enter Montana along the water courses from the east, but their occurrence in the main elevations of the Rockies is probably rare.

The biological facts of most interest in connection with the group seem to pertain to the floral structures which provide means of cross-pollination. The nectar-secreting glandular disk is easily accessible to various insects, but is especially visited by flies. Muller states that spiders attracted to some species by the numbers of these insects are themselves responsible for the transfer of pollen from flower to flower. The unisexual flowers of some genera and species necessitate pollen transfer, and Darwin in the case of the European Spindle Tree cites the fact of a complete series of transitional forms from the purely pistillate condition through perfect flowers to the purely staminate. Seeds are dispersed by the wind, either directly, owing to their small size, or through the agency of wings developed on the fruit of some species, or through the visits of birds to which the fruit of some species is attractive by reason of its red color and somewhat fleshy character.

A few minor uses in medicine and the arts, the edible fruit borne by a species or two, and the desirability of some for ornamental planting cover the scope of utility among the members of this family.

Key to the Genera

Climbing vine, leaves alternate.......................... *Celastrus*
Erect shrubs, leaves opposite
  Leaves about 2 inches long, deciduous.................. *Euonymus*
  Leaves an inch or less long, evergreen................. *Pachystima*

CELÀSTRUS

The species of this genus are usually climbing shrubs. The leaves are alternate, thin and deciduous. The flowers appear in a terminal cluster in the form of a raceme or panicle, and are perfect or with either stamens or pistils. The sepals are 5 and the calyx supports a glandular disk, at the margin of which 5 petals are inserted alternating with the sepals. In the case of the staminate or perfect flowers 5 stamens are inserted in the sinuses of the 5-lobed disk. The ovary is inserted on the disk, is 2- to 4-lobed, with an equal number of chambers and stigmatic branches and a thick style. Two ovules are borne in each cell of the ovary on the axis, and two seeds mature in each cell of the capsule, which opens by vertical clefts into each chamber and is enclosed in a scarlet aril, an outgrowth of the seed-coat and stalk.

About thirty species of *Celastrus* are known, mostly natives of the Old World and especially of the islands and the continent of Asia. Only one is known to North America, where it is found from Quebec to North Carolina, especially along the mountains, and across the northern states to the Rocky Mountains.

Several species of this genus are widely planted as ornamental vines, which are rendered attractive by their bright-colored fruits and handsome foliage.

Celastrus scándens L.

False Bittersweet. Fig. 42

A twining, woody vine ascending trees to a height of 25 feet or more or trailing on the ground, the young shoots green, changing later to a chestnut brown, smooth and slender; leaves alternate, appearing 2-ranked by the twisting of the petiole, 2 to 5 inches long, 1 to 3 inches wide, oval, ovate or obovate, sharp or taper-pointed at the apex, rounded or narrowed at the base, the margin crenate, the surface smooth on both sides; petiole usually less than 1 inch long; the inflorescence of small greenish flowers appears in the form of a small cluster at the end of a slender branch, or the flowers are in smaller groups in the axils of the uppermost leaves, their slender pedicels jointed about midway, the flowers less than ¼ inch broad, the receptacle bowl-shaped, the sepals thin and blunt, the petals 2 to 3 times as long as the sepals, green or verging on yellow; fruit a yellow capsule, up to ½ inch in diameter, splitting into 2 to 4 thin, ovate valves to expose a few seeds enclosed in a showy red aril; seeds about ⅛ inch long, oval, dark-colored, smooth.

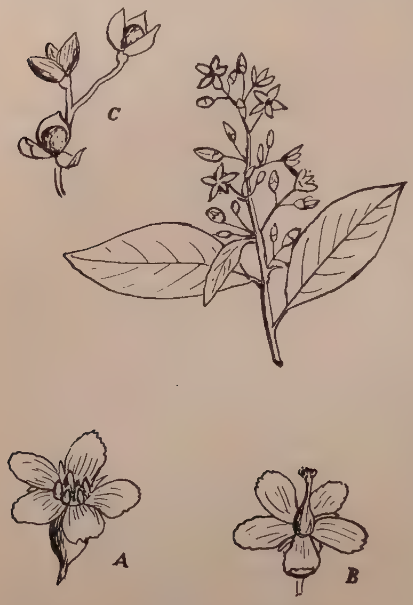

Fig. 42.—*Celastrus scandens* L.
False Bittersweet

Shoot about three-fifths natural size; *A,* staminate flower; *B,* pistillate flower; *C,* fruit. After Britton and Brown.

This species is distributed from the Atlantic Coast to the Rocky Mountains, in which it is found at places from New Mexico northward to Montana. Probably along the Missouri and the Yellowstone and their tributaries, but sparingly represented, if present at all, in the main ranges of the Rockies.

EUONỲMUS

The species of *Euonymus* are shrubs with more or less angled branches and opposite, petioled, deciduous leaves, with entire or serrate margin and perfect flowers in small axillary clusters or solitary. The calyx is 4- to 5-parted, the petals equal in number and alternate, the stamens 4 to 5 and alternate with the petals, inserted on the disk, their filaments short and anthers 2-celled. The disk is flat, 4- to 5-lobed. The ovary is 3- to 5-celled, with short style or none and a stigma with lobes equaling in number the cells of the ovary. The fruit is a rounded or winged capsule having as many cells as the ovary, each containing 1 or 2 seeds, which are discharged by the splitting of the capsule along corresponding portions of the exterior wall. The seeds are enclosed in a red, or orange-colored aril.

Over one hundred species of *Euonymus* are known, distributed from the Himalayas throughout eastern Asia and south to Australia. In North America a few species are found in the Atlantic States, including *E. europaeus,* which has escaped from cultivation. One of these species has found its way westward and is occasionally found in our flora.

Some of the members of this genus are widely planted owing to the attractive qualities of leaves and fruits. Among these is the European Spindle Tree (*E. europaeus*), and a handsome climbing form introduced from Japan. The wood has a few minor economic uses.

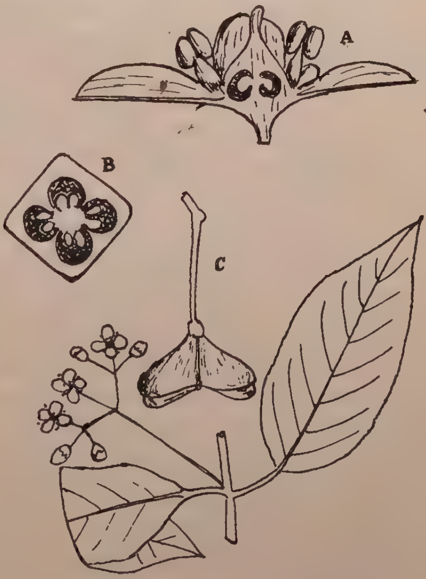

FIG. 43.—*Euonymus atropurpureus* Jacq. Wahoo, Burning Bush

Leaves ×½; *A,* flower, ×11; *B,* section of ovary, ×22; *C,* fruit. After Britton and Brown in part.

Euonymus atropurpùreus Jacq.

Wahoo, Burning Bush.

FIG. 43

A shrub or a small tree, in most favorable situations reaching a height of 25 feet, with bluntly 4-angled grayish twigs, which in the first season are green and smooth; leaves opposite, 2 to 5 inches long, 1 to 2 inches wide, oval, with taper-pointed apex and narrowed base, the margin finely cut into many rounded teeth directed forward, the blade thin, smooth on both sides, or with short, scattering hairs beneath; petioles less than 1 inch long, smooth; inflorescence a delicate, widely forking cyme in the axil of a leaf, the peduncle and pedicels slender and smooth, the latter subtended by minute, thick bracts, the flowers ¼ to ½ inch broad; calyx shallow, with 4 rounded lobes, petals broad, purple, about ⅛ inch or more long, with undulate margin; stamens 4, short; fruit a capsule, deeply 2- to 4-lobed, about ½ inch in diameter, each lobe splitting open to expose one or more seeds covered with a red aril.

The Wahoo is found from Ontario to Florida and west to the Rocky Mountains, and from Montana to Oklahoma.

The plant was first described by Jacquin in 1772. Hooker in 1831 referred to an observation by Douglas that this plant occurs on the banks of streams about the Columbia, and Nuttall (1841) described it as having smooth leaves, and called it *E. occidentalis,* a name by which it is now known to some authors.

PACHYSTÌMA

The genus *Pachystima* is represented in our flora by low, evergreen shrubs, with small, opposite, leathery leaves. The flowers are small, solitary or clustered in the axils of the leaves, and are built on the plan of 4, there being sepals, petals, and stamens to the number of 4 each and alternate with one another; the pistil consists of 2 united carpels, forming a 2-celled ovary, short style and 2-lobed stigma. The ovary is immersed in the glandular disk, under the margins of which the stamens are inserted. Each chamber of the ovary holds 2 or more ovules, which at maturity exhibit a white, many-lobed aril at the base. The capsule opens by clefts into each of the two cells.

Two or four species, according to opinion, are known to North America, to which the genus belongs. One of these is found on the Atlantic Coast in the mountains of Virginia; the others occur in the Rocky Mountains and the coast regions to the west.

Pachystima Myrsinìtes (Pursh) Raf.

Mountain Lover. Fig. 44

A shrub, 1 to 4 feet high, more or less freely branched, the twigs straight, slender, somewhat angled, dark gray or brown; leaves opposite, nearly sessile, leathery, ½ to 1 inch long, ⅛ to ⅓ inch wide, oval or elliptical, blunt or rounded at the apex, usually narrowed at the base, the margin entire or marked by a few shallow teeth, rolled somewhat toward the lower side, the surface smooth, green, somewhat paler beneath, flowers very small, numerous, single or in small groups in the axils of the leaves; calyx shallow, with 4 blunt, green lobes; petals thin, purple, faintly veined, ovate and with uneven margin; stamens 4, short; fruit a thin-walled pod about ¼ inch long, smooth, with persistent style.

This plant is found in the Rocky Mountains from Alberta to New Mexico and west to the coast. In Idaho it is reported from the Moscow Mountains; in Montana in the mountains about Missoula and Columbia Falls, in Glacier Park, and elsewhere. In the Canadian Rockies it is found on the Portage and Flathead rivers, in Beaver Valley, and at Glacier and throughout the Selkirks.

In the mountains of western Montana it is one of the commonest shrubs at altitudes of from 4,000 to 7,000 feet. It occurs usually in moist, shady woods and has frequently been remarked by Lewis, Douglas, Nuttall, and other travelers. It is very abundant in parts of the mountains of British America, where Dawson speaks of it as an especially characteristic indicator of a cool, moisture-laden atmosphere.

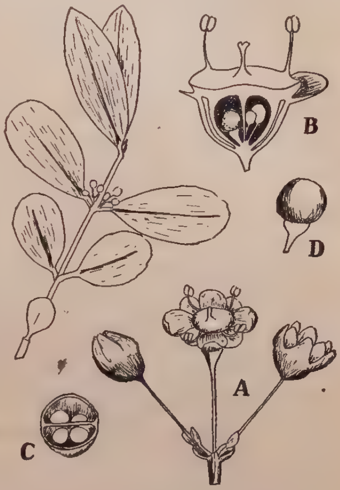

Fig. 44.—*Pachystima Myrsinites* (Pursh) Raf. Mountain Lover

Shoot about natural size; *A*, cyme; *B*, section through ovary, and *C*, transverse section through same; *D*, fruit. After Hooker in part.

Pursh, referring to the collections of Lewis and Clark, first brought the plant to notice under the name *Ilex Myrsinites* in 1814. Hooker in 1831 described it as *Myginda myrtifolia* and Nuttall in 1841, as *Oreophila myrtifolia*. The present name dates from Rafinesque in 1818.

Two other species, *Pachystima macrophyllum* and *P. Schaefferi*, have been described by Farr and are recognized by some botanists. Both were collected at Bear Creek Station on the Canadian Pacific Railroad. The descriptions of these, however, run so close to *P. Myrsinites* in essential features as to be difficult to distinguish.

ANACARDIÀCEAE

Sumac Family

The Sumac Family consists of shrubs and trees of varied size and appearance, some evergreen, others deciduous, most of them erect, but some of vine-like climbing habit, all with a milky or resinous juice. The leaves of most species are compound, most of them large. The leaves are alternate in position, without stipules. The inflorescence is a terminal or sometimes axillary cluster, the individual flowers small, regular, and of a greenish color. The sepals, normally 5, vary from 3 to 7, and the petals, which are usually 5, alternate in position with the sepals. The stamens in turn alternate with the petals and stand opposite the sepals, and are inserted at the border of a glandular disk. The pistil rises through the center of the disk, and is usually formed by the union of 3 carpels, surmounted by 3 styles, ending in small stigmas. The ovary is divided into two or more chambers, or undivided, with one ovule usually in each. The fruit is generally a small, semi-woody, globular body, or drupe, containing a single seed.

There are several hundred species in this family, grouped in sixty or more genera, most abundant in warm or tropical regions, a few belonging to the temperate latitudes. In the East Indies, the Mediterranean region, tropical Africa, and the tropics of the Western Hemisphere they are well represented. In former geological periods this family had a wider geographic range to the north as indicated by the fossils of the Tertiary.

The flowers of the family present either the perfect condition, in which both stamens and pistils appear in the same flower, or the imperfect, in which either stamens or pistils are present, or they show transitional phases where stamens or pistils may be rudimentary. This fact and the tendency of many plants of the family to mature the different organs at different times and to construct flowers with evident relation to insect visitation, as for instance the nectar-secreting disk of the flower, all indicate that self-pollination here plays a very minor part in the work of fertilization. Although the individual flowers are small, when massed in the inflorescence they are more or less conspicuous and are visited by insects of various kinds.

Plants of the Sumac Family have a wide range of uses, which pertain, however, mostly to the tropical species. They yield medicinal substances, edible fruits, fine varnishes or lacquers, and many woods useful to dyers and cabinet-makers, and some, like the Peruvian Pepper Tree (*Schinus*) and the Smoke Tree (*Cotinus*), are widely planted for ornamental purposes. Some are poisonous to the touch, or even to approach, owing to the volatile nature of the poisonous secretions.

Some authors recognize two genera in the Rocky Mountains, *Rhus* and *Toxicodendron,* while by others the few species belonging to the region are described under *Rhus,* as will be done here.

RHÙS

The members of this genus are shrubs of differing habit. The leaves are compound by division into a terminal and one or more pairs of lateral leaflets, which are more or less toothed. The inflorescence is a terminal or axillary cluster (panicle) of small greenish flowers, which contain either stamens or pistils or both in the same flower, or the stamens and pistils are borne on different plants. The calyx is parted into 5 lobes, the petals 5, and the stamens 5, as a rule, in successive circles and alternating position. The stamens are inserted at the edge of a thickened annular disk, which surrounds the pistil, situated at the center and composed usually of three carpels. The ovary contains a single chamber, bearing one or more ovules suspended from above. The fruit ripens into a small, globular drupe.

Opinions differ as to the number of species, some authors citing one hundred and fifty, throughout the North and South Temperate latitudes, but most abundant in South Africa. Six or eight species may be found in the Rocky Mountains, of which those described below are well-known.

Certain products of this genus are useful in the arts. The leaves and bark of most species contain tannin, and *Rhus coriaria* of southern Europe is used for tanning leather. A fine lacquer used in China and Japan is made from *R. vermiciflua,* and another species yields wax used for candles in Japan and also exported for various purposes. Various exotic species are widely planted as ornamentals, particularly *R. javanica* of eastern Asia.

KEY TO THE SPECIES OF RHUS

Leaves a foot or more long; leaflets 13–21 .... 1. *R. glabra*
Leaves much smaller; leaflets 3
  Leaflets less than 1 inch long .... 2. *R. trilobata*
  Leaflets 2 to 4 inches long .... 3. *R. Rydbergii*

1. Rhus glàbra L.

Scarlet Sumac. FIG. 45. PLATE 27

A shrub, or sometimes a small tree, 2 to 10 feet high, sparingly branched, stems thick, somewhat angled, reddish-brown, smooth, but covered with a bloom, leaf-scars prominent, crescentic; winter buds small, hairy, almost surrounded by the leaf-scar; leaves 8 to 14 inches long, pinnately compound with an odd number of leaflets, 13 to 21 or more, 2 to 4 inches long, ½ to 1 inch wide, oblong or lanceolate, sharp or taper-pointed at the apex, rounded and often oblique at the base, the margin sharply serrate, dark green above and pale and distinctly covered with a bloom beneath; petioles 2 to 3 inches long, round and smooth; inflorescence 3 to 6 inches long, a broad pyramidal panicle, the axis and branches hairy, terminal at the ends of erect or ascending branches, the flowers small, greenish; sepals about 1/16 inch long, sharp-pointed; petals ⅛ inch long, oblong, yellowish; stamens shorter than the petals; fruit ⅛ inch or more in diameter, with a velvety covering of short, red, acid-bearing hairs, in a dense, conical mass at the top of the stem.

The distribution of *Rhus glabra* is throughout the northern part of the continent from Nova Scotia to British Columbia, reaching southward on the Atlantic Coast to Florida, on the Pacific to Oregon, and in the Rocky Mountains to Arizona and New Mexico. In Idaho it is reported from Nez Perce County; in Montana it is found near Missoula, near Ravalli, and at other places.

The dry slopes of the foothills in western Montana are often covered with a low growth of this shrub, 2 feet or less in height, usually on sunny, southern exposures. In the Miller Creek Valley near Missoula it reaches 6 to 8 feet in height. It is not generally common, but here and there becomes locally prominent.

While a difference of opinion obtains as to the identity of the western plant, some regarding the western form as a distinct species—*Rhus occidentalis* (Torr.) Blank and *R. cismontana* Greene—and others regarding it a variety—*R. glabra* var. *occidentalis*—the slight and uncertain differences between the Eastern and Western material seem to justify the view that the two species are the same.

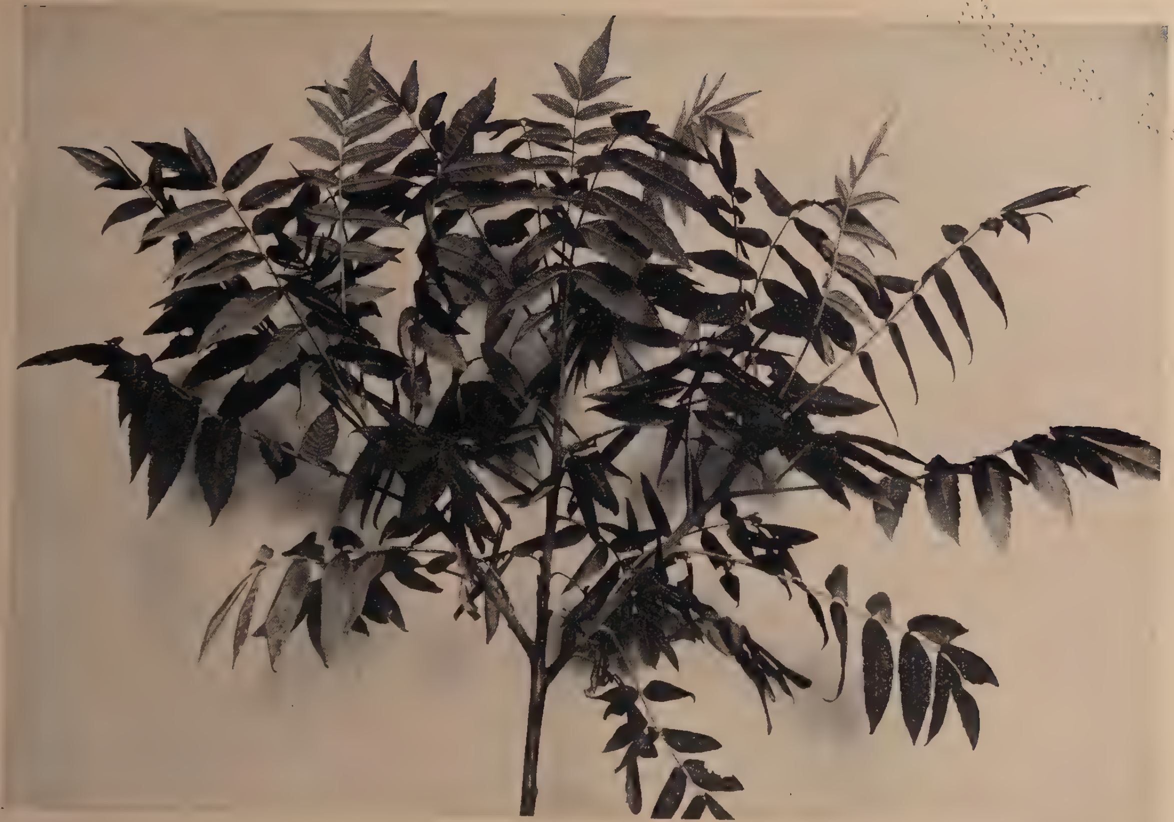

PLATE 27 (p. 214)

Sumac from the vicinity of Missoula, Montana

Rhus glabra L.

2. **Rhus trilobàta** Nutt.

Skunk Bush

A low shrub, usually 2 to 3 feet in height, of spreading habit, the branches irregular and crooked, gray, the youngest with a coating of minute hairs, the slender twigs more or less angled, and bearing elevated leaf-scars; leaves 1 to 2 inches long, of unpleasant odor, compound by division into 3 parts, the leaflets ½ to 1 inch long, the terminal largest, all ovate or obovate in outline, the apex blunt or rounded, the base of the terminal leaflet narrowed, of the others blunt or rounded, the margin lobed and set with rounded teeth, the surface smooth and dark green above, paler and minutely hairy beneath; petioles ¼ to ½ inch long, finely hairy; flowers less than ⅛ inch long, appearing before the leaves in small compact, rounded, or cylindrical clusters, yellow; sepals round or oval; petals about twice as long as the sepals; fruit red, ¼ inch or less in diameter.

With a wide general range through the western part of the United States from the Great Plains to the Pacific Coast, this plant occupies especially the drier grassy slopes from the British possessions to Mexico. In Montana it occurs in low, scraggy form on the bluffs near Forsythe and Havre, and about Boulder, Miles City, and Great Falls.

Nuttall's original description of *Rhus trilobata* appeared in 1838, from material collected in the "central chain of the Rocky Mountains."

3. **Rhus Rydbèrgii** Small

Poison Oak. Fig. 45. Plate 28

A single-stemmed shrub, usually less than 3 feet high, often growing low among weeds and grasses, the stems somewhat rough, gray, with deeply crescentic leaf-scars; leaves compound, 4 to 6 inches broad, consisting of 3 leaflets, each usually 2 to 3 inches long, 1 to 2 inches wide, taper-pointed or sharp at the apex, broad or rounded at the base, more or less coarsely and broadly toothed on the margin, smooth above, with more or less scattering hairs beneath and more abundant along the veins; petioles 4 to 6 inches long, straight, slender; inflorescence an elongated cluster or narrow panicle, 2 to 4 inches in length, terminal or more often arising from the axils of the upper leaves, the branches more or less hairy under the lens, the flowers about ⅛ inch long; sepals oblong; petals about twice as long as the sepals, oblanceolate, clearly veined; fruit less than ¼ inch in diameter, white, globose, depressed at the apex, bearing a trace of the persistent style and with numerous ribs from base to apex.

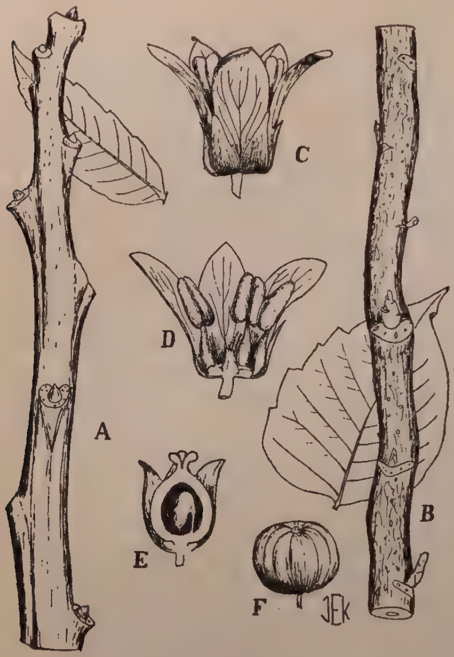

FIG. 45.—*Rhus glabra* L. Scarlet Sumac
R. Rydbergii Small. Poison Oak
A, stem of *R. glabra,* natural size, and leaflet, ×½; *B,* stem of *R. Rydbergii,* natural size, and leaflet, ×½; *C* and *D,* flowers, and *F,* fruit of same, ×5; *E,* pistillate flower of *R. trilobata,* ×5.

The distribution of *Rhus Rydbergii* covers the Northwest from British Columbia to Oregon and east to South Dakota and Kansas. It extends through the Rocky Mountains south to New Mexico and Arizona. In Montana it is common about Missoula, Great Falls, and other places. The favorite habitat of the plant seems to be the open slopes of foothills on sunny exposures.

From *R. Toxicodendron,* the species common throughout the Atlantic States, *R. Rydbergii* is supposed to differ by having toothed and smooth leaves instead of sinuately margined and pubescent ones, and by an erect instead of a climbing habit, which differences may be found to be less constant upon further study of the Western material.

ACERÀCEAE

MAPLE FAMILY

The Maple Family consists of trees and shrubs with watery and often sweet sap, and mostly firm, hard wood. The young twigs as a rule stand in opposite pairs. The leaves are opposite,

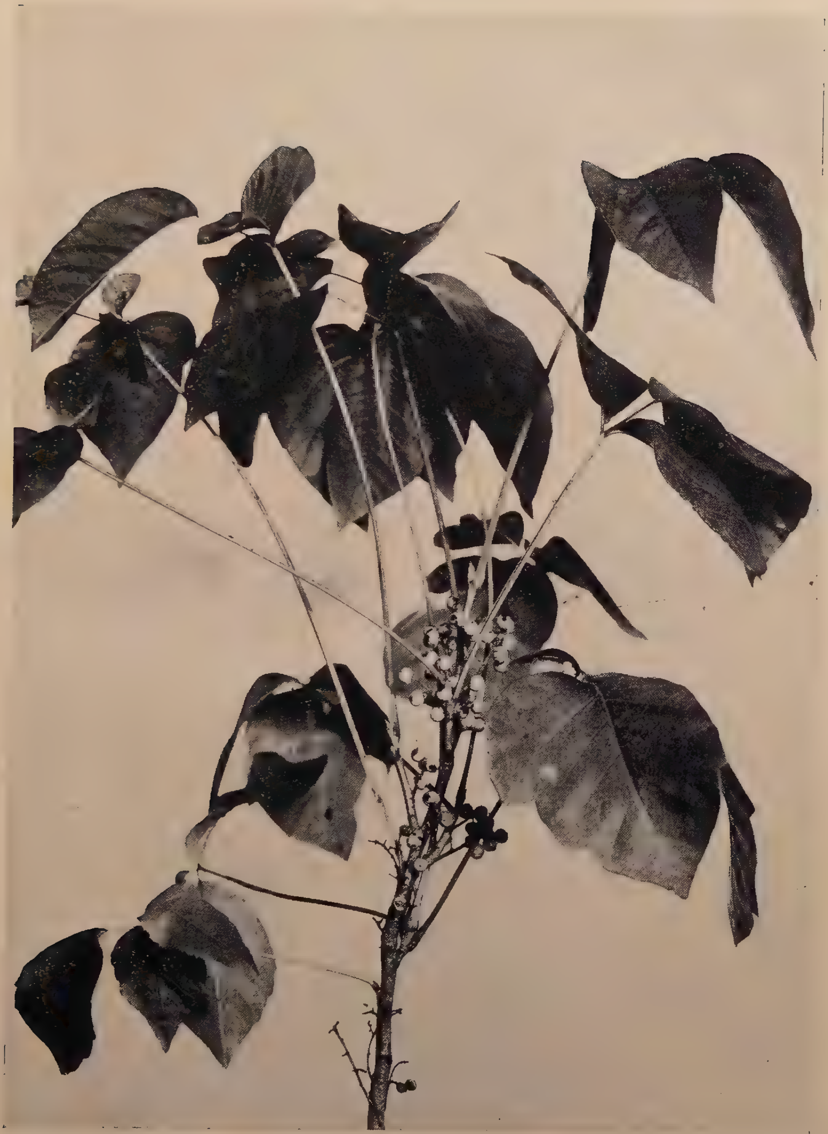

PLATE 28 (p. 215) *Rhus Rydbergii* Small

Poison oak. Leaf and fruit in August

successive pairs standing at right angles to one another, the so-called decussate formation. The leaves of the numerous species vary from almost entire to compound, though the typical condition is the familiar one with broad blade and palmate lobing. The order and sequence of the scales of the winter buds is the same as that of the leaves, which in some of the species may be traced in diminishing sizes successively to the smallest and outermost bud scales. The leaves are without stipules. Flowers are borne in clusters of few or many, which in most maples are terminal on short lateral shoots, accompanied by a pair of leaves. The form of the inflorescence in many cases is a raceme, either simple or compound, but often this is reduced to a fascicle of pedicels radiating from a common base. The flowers are usually small, bearing either stamens or pistils or both, green or tinged with red or yellow, the calyx generally 5-parted, its segments overlapping in the bud. The petals alternate with the sepals, equal in number or none, and within their circle a fleshy disk bears 4 to 12 stamens, surrounding the pistil. The stamens, while quite variable in number, may be regarded as normally 10, in two series, conforming to the structure of the calyx and corolla. The pistil consists of two carpels joined along the inner face and separated at the top into two stigmatic branches, and as to the ovary divided into two chambers, each containing a single ovule attached to the dividing wall. The fruit is produced by the enlargement of the ovary and the radial extension of the walls of the carpels on opposite sides, forming thin wings in the interest of dissemination by the wind. The carpels when ripe separate through the median partition, each carrying a single seed, containing a large embryo with two folded cotyledons and no endosperm.

The maples are natives of the temperate latitudes of the Northern Hemisphere, with the center of their greatest development from the Himalayas to Central China and in Japan. In North America they are widely distributed over the continent from Mexico northward. There are few species in the Rocky Mountains, and those of the Pacific Coast are quite different from the ones in the Atlantic region, where they are much more numerous. Fossils of widely differing forms are abundant over a wide geographic range in the Northern Hemisphere in the strata of the Tertiary and subsequent times.

The unequal development of stamens and pistils in the same flowers reaches its culmination in the purely unisexual condition which is often exhibited, and which, in the Box Elders for instance, is carried to the extent of complete segregation of stamens and pistils on separate plants. The partial or total suppression of one organ or the other in the flowers insures a large degree of cross-pollination, readily effected by the various insects whose visits to the flowers are induced by the ample nectar secretions of the floral disk. Hybrids appear to be common in nature as well as in horticulture.

The usefulness of the Maple Family is a matter of common knowledge, with reference particularly to the special applications of the wood, and the sugar produced by certain species. No mean additions are made to the ornamental plantings of parks and gardens by the introduction of exotic species, like the various cut-leaved varieties of *Acer palmatum* of Japan, and others both native and foreign, and many planted for shade along city streets. In some sections, particularly in the drier plains and mountain region of the west, the Norway Maple (*A. platanoides*) and the Sycamore Maple (*A. pseudoplatanus*) do very well, the former being very extensively planted.

The American members of this family are all included under the genus *Acer* by some authors, while others prefer to call the Box Elders by the generic name of *Negundo*. The former practice will be followed here. One other genus of the family is also known, the Asiatic *Dipteronia,* in which the wing of the fruit extends entirely around the ovary.

ACER

MAPLES

The characters of the genus are included in the foregoing description of the family.

KEY TO THE SPECIES OF ACER

Leaves simple
    Leaves sharply toothed.......................... 1. *A. glabrum*
    Leaves round-toothed.......................... 2. *A. grandidentatum*
Leaves compound.................................. 3. *A. Negundo*

1. **Acer glàbrum** Torr.

Rocky Mountain Maple. Fig. 46.

Usually a shrub in our range, but occasionally a tree reaching rarely 40 feet in height and a stem diameter of 12 to 18 inches, with smooth, gray bark on stems and older branches, the twigs slender, smooth, dark red, straight or slightly curved; nodes slightly swollen, bearing crescentic or **V**-shaped leaf-scars; winter buds usually ¼ inch long or less, standing opposite or terminal on the branch, plump, ovate, somewhat flattened against the stem; leaves 1 to 4 inches broad, about as long as broad, rounded in outline, the apex sharp, taper-pointed, variable at the base, from wedge-shaped to rounded or cordate, cut into 3 sharp-pointed lobes, beset with numerous, unequal, sharp teeth directed forward, smooth on both sides, paler beneath and marked by conspicuous primary and secondary veins; petioles 1 to 5 inches long, slender; flowers small, about ¼ inch broad, in branching clusters of about 1 inch in length, from winter buds, on slender, smooth pedicels; sepals about ⅛ inch long, oblong, petal-like; petals about as long as the sepals, greenish-yellow; stamens about 8, with slender filaments, about as long as the petals; ovary smooth, with short, blunt lobes; fruit of 2 nut-like carpels, each produced into a thin wing, the wings of the two carpels diverging at an acute angle, the carpel and its wing an inch or more in length.

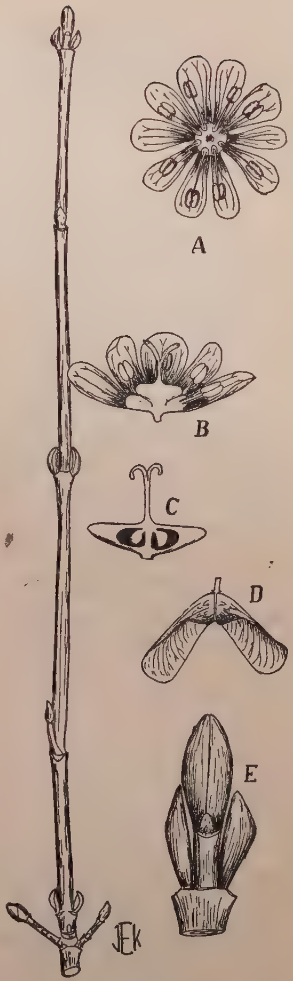

Fig. 46.—*Acer glabrum* Torr. Rocky Mountain Maple

Twig about one-half natural size; *A* and *B*, flowers, ×2 and 4 respectively; *C*, section through pistil, ×4; *D*, fruit, about half natural size; *E*, buds, ×2.

The range of this tree is from the mountains of New Mexico and Arizona and southern California northward through the Rocky Mountains and coast region to Alaska and British America, and over the adjacent plains eastward to Nebraska. In Montana it is found at Missoula, Flathead

Lake, Belt Mountains, in Meagher and Gallatin counties, and elsewhere; in Idaho, in the Coeur d'Alene Mountains and in Canyon, Kootenai, Owyhee, and Nez Perce counties; in the Canadian Rockies, about Waterton Lake, in South Kootenai and Bow River passes, at Banff, Field, and generally about the sources of the Columbia River.

In Western Montana this is one of the most common constituents of the vegetation from dry slopes of the foothills to bottom lands and at all elevations up to 5,000 feet or more. While usually a shrub of 8 to 10 feet, it may be found in some of the deep forests of the Flathead Valley, reaching a height of 30 feet and a trunk diameter of 8 to 10 inches, with a clear length sometimes of 15 to 20 feet.

This species, brought to notice by Dr. Torrey in 1826, has by some botanists been limited in its distribution to the more southern ranges of the Rockies, and has been differentiated from another very similar form, which they have regarded as a distinct species with a more northerly range, and which was named by Hooker, *Acer Douglasii.* This distinction, based upon the depth of division between the lobes of the leaf, is held by others to be unreliable, and *A. Douglasii* therefore regarded as synonymous with *A. glabrum.*

2. **Acer grandidentàtum** Nutt.

Sugar Maple

A tree reaching at its best 30 to 40 feet in height, with a trunk diameter of 8 to 10 inches, stout branches covered with gray, slightly rough bark, and twigs of a reddish-gray or brown color; winter buds brown, sharp-pointed, about ⅛ inch long; leaves 1 to 4 inches broad, 1 to 4 inches long, acute at the apex but with the point blunted, usually cordate at the base, cut into three principal lobes by rounded sinuses, each lobe margined with coarse, blunt, usually rounded teeth, smooth and dark green above, pubescent, at least on the veins, and paler beneath; petioles 1 to 2 inches long, smooth, with broad, clasping bases; flowers perfect, or with either stamens or pistils, appearing with the leaves on slender pedicels which bear a few long, white hairs, the clusters few-flowered, about 1 inch long; calyx and receptacle together about ⅛ inch long, about half or a little more the length of the flower, cup-shaped, the lobes rounded; petals wanting; stamens longer than the calyx, 7 to 8 in number, in the pistillate flower shorter than the calyx; fruit of 2 oval, smooth carpels, bearing wings an inch or more in length, the space between the wings at the base about ½ inch, widening gradually outward.

The range of this species extends from Montana to Mexico, and from Texas to Arizona. In Idaho it has been collected at Pocatello, and was originally discovered by Nuttall on the banks of the Bear River. While reported from Montana it is probably very rare, unless in the southern or southwestern part of the state above 4,000 feet elevation.

3. **Acer Negùndo** L.

Box Elder

A tree, in most favorable situations 50 to 75 feet high, 2 to 4 feet in diameter, with gray, firm, deeply fissured bark ½ inch or less in thickness, the young twigs green and smooth, or somewhat pubescent, rather widely branching in the open and with a rounded crown; winter buds ⅛ inch or more in length, acute; leaves compound by division into 3 to 5 leaflets, which measure 2 to 4 inches long, 2 inches or more broad, the apex sharp, with a tapering point, the base usually wedge-shaped, coarsely and irregularly serrate above the middle, hairy on both sides when young, when mature usually smooth above, somewhat pubescent beneath, especially along the veins; petioles 2 to 3 inches long; flowers small, with only stamens or pistils but not both, the staminate and pistillate on different trees, both kinds appearing from winter buds formed in the axils of last season's leaves, the staminate in fascicles emerging from the tuft of bud scales, the pistillate in drooping racemes; sepals 5 on a receptacle bell-shaped in the staminate flower, smaller in the pistillate; petals wanting; stamens 4 to 6, beaked at the apex, filaments long, slender; fruit 1 to 2 inches long, the halves diverging at an acute angle, smooth, persistent on the slender pedicels until the following spring.

The Box Elder is distributed from the Atlantic Coast to the eastern slope of the Rocky Mountains, and from Canada to New Mexico. In Montana it is found at Malta, Stillwater, Helena, and elsewhere.

RHAMNÀCEAE

Buckthorn Family

The trees and shrubs of which this family is composed are common members of the northern flora. While some of the group are climbing plants and many in other parts of the world are thorny, ours are unarmed shrubs or small trees, or, in one species, prostrate. The leaves are alternate in position, persistent or deciduous, and often marked by 3 to 5 prominent veins ascending from the base. The flowers are borne in small axillary groups, or in larger, terminal clusters of the cymose type, and are usually small and inconspicuous, except as they occur in masses. The flower is regular, or radially symmetrical, the plan of 5 predominating. The receptacle is flat, cup-shaped or tubular, and is lined below by a glandular tissue or disk, which in some cases develops into an inner crown-like fold or series of lobes, sometimes rolled inward. On the margin of the receptacle are inserted 5 sepals, 5 petals, and 5 stamens, the sepals and petals alternate with one another, the stamens standing opposite the petals and partially enveloped by them. The pistil, standing at the bottom of the concave receptacle, to which it is often united laterally, is composed of 2 to 5 carpels, often 3, which are united to form an ovary with as many cells and a straight style, divided or lobed in the stigmatic region. In each cell of the ovary at the base of the internal angle are inserted one or (rarely) two ovules. The fruit ripens as a dry capsule or a succulent, berry-like drupe, containing 2 to 5, one-seeded stones. The embryo is embedded in the fleshy endosperm, or the latter is wanting and the embryo then has thick cotyledons.

The Buckthorn Family is widely distributed throughout the world, except in the colder latitudes. They appear most abundant in the moderately hot regions of most countries and are not rare in the tropics. Within the family are groups of more or less definite form, and correspondingly definite geographic range. Of about fifty genera comprising this family, but two are found in the Rocky Mountains.

In some plants of the Buckthorn Family, the flowers, while usually perfect, may lack stamens or pistils. This separation of the organs, as has been noted in previous cases, results in more certain pollen transfer, and consequent advantage in the production of seeds. The ample nectariferous tissues which most flowers possess are responsible for the attraction of numerous flies and bees, through whose agency the pollen is carried from flower to flower. In the dispersal of seeds the differences in structure bring into play different means by which the dissemination is accomplished. The dry capsules of some species split downward from the top, releasing a tension in the walls, which results in the seeds being expelled with some force. In other cases the production of succulent fruits invites the attention of animals, especially birds, which find them useful as food, and by which they probably find their means of widest distribution. Again, some species, not of our regions, develop a wing-like expansion of the ovary wall as a means of dispersal by the wind.

The useful species of this family are not numerous, but in the production of a few drugs, dyestuffs, some edible fruits, and a wood suitable for the manufacture of a light and porous charcoal appear some of the lines of economic value for which they are known in different parts of the world.

Key to the Genera

Leaves mostly pinnately veined, fruit fleshy................. *Rhamnus*
Leaves nerved from the base, fruit dry..................... *Ceanothus*

RHÀMNUS

The species of *Rhamnus* are small trees or shrubs, in our species with alternate, pinnately veined and deciduous leaves. The flowers usually appear in small axillary clusters, perfect or with either stamens or pistils. The receptacle of the flower is cup-shaped, or urn-shaped, the sepals 4 to 5, the petals and stamens of the same number. The pistil is attached to the receptacle only at the base, and consists of a 3- or 4-celled ovary and style cleft at the top into 3 to 4 branches. The fruit is a berry-like drupe, containing 2 to 4 small, nut-like stones, each containing a single obovoid seed with fleshy endosperm.

At least seventy-five species of *Rhamnus* are known, natives of the temperate or warm regions. About six have been described from the Rocky Mountains. The principal center of their development is in Europe and non-tropical Asia.

Some members of the genus yield cathartic drugs, some dyestuffs, and others (*R. Frangula*) wood, sought for the manufacture of charcoal for special purposes. *Rhamnus Frangula* and *R. cathartica* have been introduced into the United States from Europe, and in the Atlantic States have escaped from cultivation and become naturalized.

Key to the Species of Rhamnus

Low shrub	1. *R. alnifolia*
Small tree	2. *R. Purshiana*

1. **Rhamnus alnifòlia** L'Her.

Alder-leaved Buckthorn. Fig. 47

A shrub, 2 to 4 feet high, branching at narrow angles, the bark on the younger twigs ashy gray, with a minute, microscopic pubescence, the leaf-scars crescentic or kidney-shaped; winter buds brown, ovate, about ⅛ to ¼ inch long; leaves 1 to 3 inches long, ½ to 1½ inches wide, oval to elliptic, usually acute at the apex, somewhat narrower at the base, the margin serrate, with fine, rounded teeth, the veins prominent, directed toward the apex at a narrow angle with the midrib, the surfaces usually smooth or with a few short hairs on the veins beneath; petioles about ¼ inch long or less; flowers appearing with the leaves, 2 or 3 in the axils, about ⅛ inch broad, mainly bearing either stamens or pistils but not both; sepals 5-pointed; petals none, stamens 5; fruit black, juicy, ¼ to ⅓ inch in diameter; stones 3-grooved.

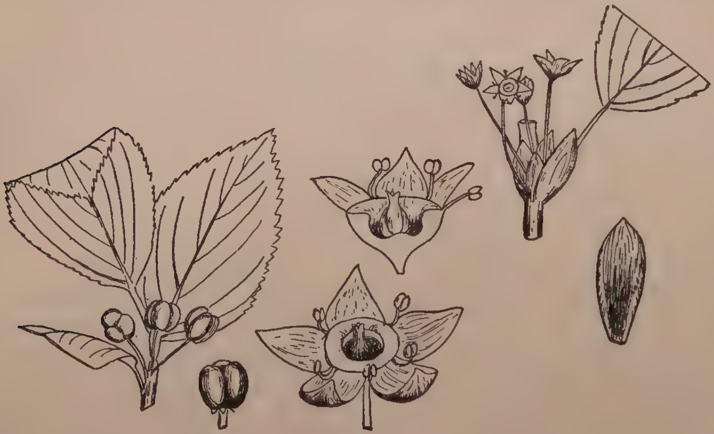

Fig. 47.—*Rhamnus alnifolia* L'Her. Alder-leaved Buckthorn
Leaves about one-third natural size. After Hooker.

The plant is transcontinental in its range, reaching from New Brunswick to British Columbia, and south to New York, Illinois, Wyoming, and California. In Yellowstone Park it occurs on Obsidian Creek and the East Fork of the Yellowstone; in Montana on the North Fork of Sun River, in the Mission Mountains, and on Lolo Creek; in Idaho, on the Kooskoosky River and in Kootenai County. In Montana it is found usually along streams and lakes and in wet woods at altitudes up to 7,500 feet.

The original description of *Rhamnus alnifolia* dates from the work of L'Heretier de Brutelle in 1788. It was noted by Richardson, Drummond, Douglas in their northern journeys in the early part of last century.

2. **Rhamnus Purshiàna** DC.

Cascara

A tree, sometimes 30 to 40 feet high and 12 to 20 inches in diameter, with smooth, gray bark and rounded head, the slender branches at first finely hairy, later becoming smooth, and for the first few years dark brown, the leaf-scars slightly elevated, oval, and transverse; winter buds naked, hairy; leaves 2 to 7 inches long, 1 to 3 wide, oval or elliptical, usually rounded at base and apex, the margin entire, wavy, or indistinctly toothed, surface smooth on both sides, but marked by numerous prominent lateral veins, which extend from the midrib to the margin; petioles ½ to 1 inch long, hairy; flowers in small rounded clusters, borne on stalks which arise from the axils of the leaves, slightly hairy up to the calyx, the flower greenish, about ⅛ inch broad; receptacle cup-shaped, sepals ovate; petals 5, minute, notched; stamens 5, short; fruit black, globular, ⅓ to ½ inch in diameter, juicy, containing 2 to 3 small stones, about ⅓ inch long.

Rhamnus Purshiana is found from British Columbia to California and east to the Rocky Mountains in Idaho and Montana, where it has been collected at Lake Pend d'Orielle, Lewiston, the Bitterroot Mountains, and Flathead Lake.

While this tree is rare in Montana and may be found only in the most humid localities and of small size, it abounds along the Pacific Coast, where it is one of the most common forest trees. The bark of the tree is used in medicine, and its collection and preparation is a local industry in the Coast Mountains of Oregon. The species is also known as Bearberry and Coffee Tree.

De Candolle's description dates from 1825 and refers to a plant collected by Lewis and Clark on the banks of the Kooskoosky River in Idaho in 1806. Menzies also found it at Nootka Sound.

CEANÒTHUS

Shrubs prostrate or erect, with vertical or ascending branches, the leaves alternate or opposite, petioled, deciduous or evergreen, marked as a rule by three or more prominent veins from the base. The small flowers are borne in terminal or axillary clusters, which in some species become quite showy. The receptacle is urn-shaped, filled with the glandular tissue of the disk, in which the ovary is immersed. The 5 petals stand alternate with the sepals and are scoop-shaped and stalked. The stamens are 5, with slender, elongated filaments. The ovary is 3-lobed and 3-celled, and the style short, 3-cleft. The fruit ripens as a 3-lobed capsule, somewhat pear-shaped, the receptacle adhering to its base. After the capsules have been separated from the receptacle the latter usually persists for months or years as a shallow, stalked cup. At maturity it divides into 3 parts as small nutlets, each containing a smooth seed with fleshy endosperm.

About fifty species of *Ceanothus* have been described, all belonging to North America, and mostly natives of the Pacific Coast. In the Rocky Mountains nine species are recognized by some authors. The three species described below may readily be identified among the plants of the northern mountains. Some species of the genus are very attractive in flower and leaf, and are planted as ornamentals; there are also distinct hybrid forms of garden origin.

KEY TO THE SPECIES OF CEANOTHUS

Leaves thin, deciduous.................................... 1. *C. sanguineus*
Leaves leathery, evergreen
    Leaves oval, finely serrate, aromatic.................... 2. *C. velutinus*
    Leaves usually spiny-toothed, not aromatic.............. 3. *C. prostratus*

1. **Ceanothus sanguíneus** Pursh

A tall shrub with slender branches, the shoots of the season green, changing to gray, then red in the following year, resin-dotted; winter buds less than ¼ inch long, flattened dorsally, smooth and shining; leaves 1 to 4 inches long, ½ to 2 inches wide, oval or ovate, blunt at the apex, rounded at the base, margin rather evenly serrate with blunt teeth, smooth above, with prominent veins, sparingly hairy beneath; inflorescence 1 to 4 inches long, white, on leafless lateral shoots from twigs of the previous season, consisting of a stout axis bearing lateral fascicles of flowers, about ⅛ inch in diameter, on uniform slender pedicels about ½ inch long; receptacle shallow, dark, sepals broad, pointed; petals white, stalked, spatulate; stamens about as long as the petals; fruit pear-shaped, 3-lobed, the receptacle persistent at its base about ⅛ inch thick.

Ceanothus sanguineus is found from British Columbia to California, and as far east as the western slopes of the Rockies in Montana, and is more or less common throughout its range on wooded uplands. In Montana it has been collected on Flathead Lake, Swan Lake, near Columbia Falls, and elsewhere.

It is recorded as being first collected on the upper Missouri by Meriwether Lewis in 1806. Douglas stated that it was "common on the banks of streams and low hills from the Rocky Mountains to the Western Ocean."

2. **Ceanothus velùtinus** Dougl.

Mountain Balm. — Fig. 48

A shrub, in the Rocky Mountains about 2 feet high, decumbent and spreading, the oldest stems covered with a thin gray bark, the younger down to the twigs of the season green, smooth, except for numerous small resin dots, when quite young more or less finely pubescent, the leaf-scars plain, transverse, narrow; winter buds covered with a few pointed, hairy, loosely overlapping scales; leaves evergreen, 1 to 3 inches long, ½ to 2 inches wide, oval, blunt or rounded at the apex, rounded or somewhat cordate at the base, the margin finely serrate with sharp teeth, the blade leathery in texture, exuding a balsamic fragrance, dark and varnished above, pale with a velvety texture beneath, showing 3 prominent yellow nerves from the base; petioles up to 1 inch long, smooth; inflorescence several inches long, terminal, or in the axils of the upper leaves, the stout axis bearing lateral fascicles of small white flowers on slender pedicels; receptacle shallow, the sepals broad and blunt; petals spatulate, less than ⅛ inch long; fruit pear-shaped, 3-lobed, about ⅛ inch thick, the receptacle persisting about its base.

The range of *C. velutinus* extends from British Columbia to California and eastward to the Black Hills, and in the Rocky Mountains from Canada south to Utah and Colorado. In Idaho it grows in Owyhee, Elmore, and Kootenai counties; in Montana, at Haugan, Missoula, Deer Lodge, and in the Mission Mountains above Flathead Lake, and in Gallatin County.

In Montana this is a plant of the more dry and barren slopes and sunny exposures up to 6,000 feet altitude, and often springs up thickly in burns. It grows low in the Rocky Mountains, but in the Coast Range of Oregon forms impenetrable thickets 8 to 10 feet high.

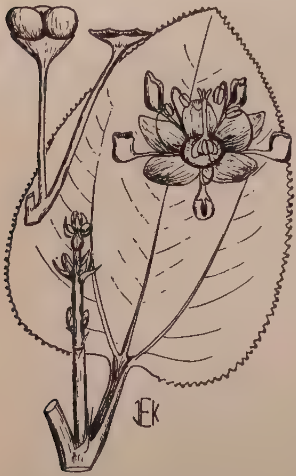

FIG. 48. — *Ceanothus velutinus* Dougl. Mountain Balm

Leaf about natural size; flower, ×5; fruit, ×2½.

Douglas described the plant in Hooker's *Flora* in 1831, and states that it was found "on subalpine hills near the sources of the Columbia, and at Kettle Falls"; and Nuttall (about 1834–1836) found it "scarcely more than knee-high" on the hills of Bear River in Idaho.

3. **Ceanothus prostràtus** Benth.

Mahala Mats

A low, prostrate shrub, the branches scraggy, striking root where in contact with the soil, forming close mats 2 to 8 feet broad, the stems dull, dark gray, the frequent, elevated leaf-scars giving a rough, jointed aspect; winter buds minute; leaves thick, evergreen, opposite, mostly less than 1 inch long, ¼ to ½ inch wide, obovate, mostly rounded at the apex, wedge-shaped at the base, spiny-toothed, especially toward the apex, upper surface smooth, varnished, the lower veiny, covered with pits lined with short hairs; petioles usually ¼ inch long or less; inflorescence a globose cluster on a stout stalk from the axil of an upper leaf, the flowers blue, less than ¼ inch broad; receptacle shallow, sepals broad, blunt, 5 in number; petals 5, broadly spatulate, stalked; stamens 5, somewhat longer than the petals; fruit about ¼ inch thick, the receptacle persistent like a cup beneath the globose, 3-lobed capsule, which opens by splitting down from the top.

This species of *Ceanothus* is found from Washington to California and Nevada and east to Idaho and possibly southwestern Montana, usually growing in open pine woods. It was first collected by Hartweg in the mountains near Sacramento, California, in 1846–1847, and described by Bentham about 1849.

CACTÀCEAE

Cactus Family

The plants of the Cactus Family are marked by a few conspicuous characteristics which are easily recognized. Their stems and branches, in many cases jointed but in others without articulations, are fleshy and usually covered with spines developed from cushions (areoles) of minute bristles, and are ridged or covered with small, rounded elevations. True leaves appear in but few forms (none in ours), but are replaced by spines, which apparently belong to arrested axillary buds in the position of the cushions. The stems are usually covered by a thick, green rind and their inner tissues are composed of thin-walled, succulent cells, as water-storage tissue, traversed by woody strands, strongly developed in arborescent forms, but in the low-growing types often meager or entirely wanting. The flowers are usually solitary, radially symmetrical, perfect, and in most cases showy. The flower is a complex structure consisting of several centrally situated carpels, and an indefinite number of stamens, petals, and sepals. The carpels are several, as indicated by the stigmatic divisions, and united to form an ovary with a single chamber, the ovules attached to the wall on as many placentae as there are branches of the stigma. The ovary wall is confluent with the tissue of the receptacle to the summit of the ovary, at which point the margin of the receptacle bears the stamens, petals, and sepals, and the carpels narrow into the style. The sepals and petals intergrade and the outside of the receptacle usually bears spiny or bristly cushions, like those of the stem, but smaller. The fruit is formed by a fleshy development of the receptacle and the ovary, or is sometimes nearly dry, in which the many small seeds are embedded in an inner juicy pulp, forming a berry.

The cacti are a distinctly American group of plants, embracing over one thousand species, most abundant in the drier and warmer regions of Mexico and the southern United States. One author recognizes five genera and forty-two species in the Rocky Mountains, of which four come within our range. The distribution of the family southward extends to the Straits of Magellan.

Biologically this family is one of surpassing interest. Probably no plants are better equipped for life in desert regions than these, with their ample reservoirs covered by a leathery rind which greatly retards the loss of water by evaporation under the strenuous conditions of drought and heat, and the effective armament of spines, enabling them to fend off the attacks of many animals attracted to their juicy tissues as a source alike of drink and food. While apparently reaching their most varied development and greatest numbers in the hottest regions of the continent, some species are found as far north as 59 degrees, and others ascend mountainsides to the very snow-line and the zone of frequent summer frosts and severe winter cold. The large and showy flowers seem to invite insect visits, and the fact that the pollen in many forms develops before the pistil matures in the same flower indicates a facility for cross-pollination. In some divisions of the family numerous hybrids are known. Although the vegetative parts of the cacti are adapted to extreme desert conditions, the flowers show no such adaptation. The large and delicate flowers usually appear during the "desert rainy season," or shortly after. The seeds germinate rapidly, in some cases even starting in the fruit, which is often sweet and palatable, seeming to indicate that in some species the seeds are distributed by animals.

The regions of the highest development of the cactus afford numerous examples of their usefulness. Probably few plants are as widely cultivated throughout Mexico as the Nopal, a tree form of the Prickly Pear, which yields abundant fruits used fresh and in conserves, and broad fleshy branches for fodder. These are now widely planted in the Mediterranean region, where they are known as the Indian Fig. Certain species of this plant have been used in Mexico from prehistoric times as a means for the cultivation of the cochineal insect, a once very profitable industry. A form of the Barrel Cactus of the Southwest has been used by the Indians from time immemorial as a source of drinking water in the emergencies to which desert life is often subject, and in the same region one often finds their lodges built of the woody ribs of the Giant Cactus, and one of their staple articles of food the fruits of this same *Sahuaro*.

Key to the Genera

Stems jointed.................................... *Opuntia*
Stems globose or ovoid............................ *Mammillaria*

OPÚNTIA

Prickly Pear

The plants of this genus in our range are low and spreading, with jointed, fleshy stems. Some of the southern species assume tree form, 10 to 20 feet in height. The branches are flattened or cylindrical, and in some species the joints separate easily from one another and, rooting where they fall, serve as means of vegetative propagation. Spines are produced from areoles, either flat or elevated, and are variable in number and character according to the species. The spines are usually accompanied by small barbed bristles, and when the shoot is quite young small, pointed, fleshy leaves appear just below each areole and soon fall away. Flowers spring from the areoles, as do also the vegetative branches, and are located near the apex of the joint, not more than one, as a rule, from a single areole. The ovary, as noted above in the description of the family, is inferior and bears an indefinite number of areoles upon its surface, from which bristles and spines usually protrude. The sepals are green or colored, variable in number, and exhibit a gradual transition into the petals, which are also numerous, larger, and more brightly colored. The many stamens, shorter than and closely arranged in a circular zone within the petals, are sensitive to contact, apparently in the interest of pollen discharge. The style is thick, bearing short stigmatic lobes at the summit. The fruit is a dry or juicy berry.

The genus *Opuntia* comprises about two hundred and fifty species of widely differing form and habit, and their geographic range covers most of North and South America. Of nineteen species described from the Rocky Mountains, only two belong to the northern ranges.

Our species are among those cacti commonly known as Prickly Pears. They spread over the surface of the ground, freely rooting from the branches, and are found in dry and sunny situations on barren ground.

In this genus are the most important of the cultivated forms, and it is said that over a score of native species furnish the Indians with edible fruits. In the drier parts of Brazil and Mexico, some of the larger Opuntias and Echinocactuses are reported to be used as water-containing fodder for live stock.

KEY TO THE SPECIES OF OPUNTIA

Joints flat	1. *O. polyacantha*
Joints nearly cylindrical	2. *O. fragilis*

1. **Opuntia polyacántha** Haw.

Prickly Pear. FIG. 49

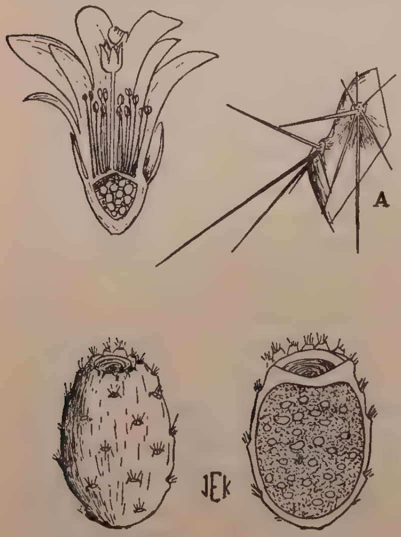

FIG. 49.—*Opuntia*. Prickly Pear

Flower and fruit, entire and in section; *A*, portion of vegetative structure showing spines and areoles. Diagrammatic.

A prostrate, spreading plant, sometimes covering several square yards from the original root, rising rarely more than 6 inches from the ground, the branches flat, each joint usually 2 to 3 inches long, by 1½ to 2 inches wide, about ½ inch in thickness, the spines 5 to 12 in a cluster, ½ to 2 inches long, reddish-brown, more or less reflexed; flowers yellow, 2 to 3 inches broad; fruit about 1 inch long, ovoid, spiny.

This cactus is found from Wisconsin and Missouri to the Rocky Mountains, and from British Columbia to New Mexico. It is not common west of the Divide in Montana, but abounds on the plains eastward along the Beaverhead, the Musselshell, the Missouri, and other rivers, considerable areas sometimes being thickly covered with it.

Haworth wrote the description of *Opuntia polyacantha* in 1819. DeCandolle also described it in 1828 as *O. missouriensis*. It was first collected on the plains of the Missouri, and owing to its great diversity of form has been known in botanical literature under many different specific and varietal names. It is most plentiful on the lower plains but reaches altitudes of 6,000 feet or more in Montana. It is found only on dry prairies and dry open hillsides. The flowering period varies from May to well along in June, depending upon the location.

2. **Opuntia fràgilis** (Nutt.) Haw.

Fragile Prickly Pear

An inconspicuous prostrate plant, its stems creeping close along the ground, the joints ovate, 1 to 2 inches long, very little flattened, easily separating, often reddish, the spines 1 to 4, from ½ to 1 inch long or more; flowers yellow, 2 inches or less broad; fruit ovate, about 1 inch long, almost devoid of spines.

The range of this species is from Wisconsin to Kansas, west across the plains to the Rocky Mountains, where it is found from British America to Utah. This is the only cactus which is at all common in western Montana, where it is not infrequently found on hot, dry slopes about Missoula, Florence, and many other places. It was first collected east of the mountains along the Missouri River. It is seldom seen in flower but propagates freely by the separation of the small joints. Because of the ease with which these joints or "sections" separate, it is often called the "Brittle *Opuntia.*"

MAMMILLÀRIA

This genus includes plants with globose or ovoid, tubercled stems, either solitary or in clusters. In ours the stems grow close to the ground, bearing tubercles spirally arranged, with areoles at their summits in which the spines are inserted. The flowers are borne near the summit of the stem, the ovary sometimes hidden among the tubercles and the calyx tube produced beyond the ovary, bell-shaped or funnelform. The petals are in several rows. The ovary is smooth, ovoid, and the style slender. The fruit is an ovoid berry, retaining the persistent corolla.

There are some hundreds of species of *Mammillaria* known to science, mostly natives of warm and tropical America. Two species are recognized as belonging to the Northern Rocky Mountains. This group is also known as *Cactus* and in part as *Coryphantha.*

KEY TO THE SPECIES OF MAMMILLARIA

Central spines 1, flowers yellow........................	1. *M. missouriensis*
Central spines several, flowers red.....................	2. *M. vivipara*

1. **Mammillaria missouriénsis** Sweet

Pincushion. Fig. 50

A small globose plant, resting snugly in the soil, mostly solitary, and usually less than 2 inches high, the tubercles about ½ inch long, or wanting; flowers yellow, slightly tinged with red, about 1 inch in length and breadth when fully open; petals about ¼ inch wide, sharp-pointed and abruptly tipped with a short bristle; stigmas short, 2 to 5, erect; berry globose, scarlet, about ¼ inch thick, ripening the following spring.

This plant grows in the dry prairies and hills from South Dakota to Montana, Colorado, and Kansas. In Montana it is reported from Deer Lodge, Great Falls, and elsewhere. Also from Yellowstone Park.

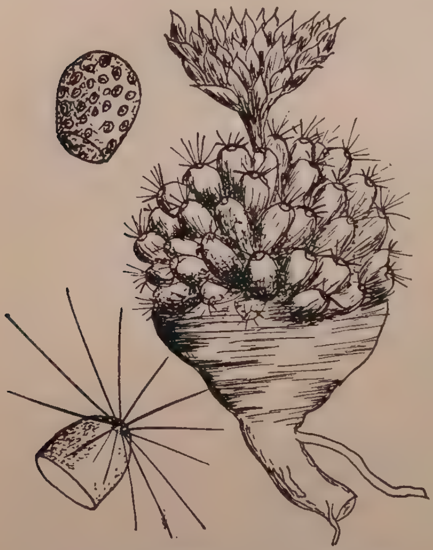

Fig. 50.—*Mammillaria missouriensis* Sweet. Pincushion
After Britton & Brown

2. **Mammillaria vivípara** Haw.

Purple Cactus

Stems usually tufted, 1 to 2 inches high, the tubercles rounded, the central spines of each cluster 3 to 4, slender, ½ inch or less long, reddish-brown, one reflexed, the others ascending, the outer spines of the group radially disposed and numbering 15 to 20, shorter than the central ones; flowers purple, about ½ inch long; fruit pale green, over ½ inch long.

The distribution of *M. vivipara* is from Manitoba and Alberta south to Kansas and Colorado, especially on the prairies; it has been collected in Montana near Great Falls and Bridger.

This plant grows usually in bunches and reproduces by offshoots, which is probably the significance of the specific name. It is found on dry hills up to 4,000 and 5,000 feet elevation.

The specific description was written by Haworth in 1819, probably from material collected in Montana, but it had previously been described by Nuttall in 1813 as *Cactus viviparus*.

ELAEAGNÀCEAE

OLEASTER FAMILY

This is a small family of trees and shrubs covered with scaly hairs. The leaves are entire, alternate or opposite. The flowers, borne in small axillary clusters or solitary, may be either staminate or pistillate or perfect. The receptacle may be flat, shallow, or tubular, the last being the case especially in the pistillate flower, in which it is constricted above the ovary, where a ring of tissue or a series of glands, alternating in position with the stamens, serve further to narrow the space surrounding the style. Above this point the receptacle extends as a calyx-tube and bears 4 lobes, which are deciduous, and usually 4 to 8 stamens, with short filaments inserted on the throat of the calyx in the perfect flowers, near the base in the staminate. The pistil is composed of a single carpel, forming an ovary, slender style, and short knob-like stigma. In single chamber of ovary one ovule arises from base of chamber; fruit nut-like, enclosed by thickened fleshy base of receptacle.

Three genera and about 20 species are recognized in this family, widely distributed in both the Old and the New World. Two of the genera are found in North America and are common in the Rocky Mountain flora.

The formation of imperfect flowers and the development of glandular tissue within the calyx point to an organization favoring cross-pollination, and that by insect agency. Definite information on this point, however, seems not to be available. The attractive and edible fleshy envelope of some fruits of the group facilitates their distribution by birds. The family contains a number of species which are partially or wholly characteristic of steppes, sandy coasts, and periodically drying water courses, and its members are seldom found at high altitudes.

KEY TO THE GENERA

Leaves alternate	*Elaeagnus*
Leaves opposite	*Lepargyraea*

ELAEÁGNUS

Shrubs, or some exotic species trees, with a silvery-scaly pubescence in the form of short-stalked hairs whose heads are expanded in the form of irregular or star-like, radiate scales. The leaves are alternate, petiolate. Imperfect or perfect flowers are borne solitary or in small groups in the axils of the leaves, on pedicels without bracts. The receptacle rises about the ovary and is constricted above it, but remains free, the part above the constriction being bell-shaped or urn-like, 4-lobed, and deciduous, the lower portion enveloping the nut with a fleshy tissue in fruit. Four stamens are borne on the throat of the perianth, alternate with its lobes. The ovary is oval or ovate, the style long and slender, the stigma knob-like.

From 30 to 40 species of *Elaeagnus* are known, belonging to Europe, Asia, and North America. One of these is found in the Rocky Mountains and comes within our range.

Some of the species are highly ornamental shrubs, attractive on account of their silvery foliage and fruits. Some are evergreen and others thorny. A number of exotic species are widely planted.

Elaeagnus argéntea Pursh

Silverberry. Fig. 51

This species is a shrub or small tree, 5 to 15 feet in height, with smooth, dull gray bark on the older branches, the young twigs a rusty brown covered with scurfy scales, the leaf-scars minute, crescentic; winter buds ⅛ inch long or less, flattened dorsally; leaves mostly 1 to 3 inches long, ⅓ to 1 inch wide, elliptic to oblong, the apex acute or rounded, wedge-shaped at the base, the margin entire, the upper and lower surfaces densely covered with short, white, scaly hairs; petioles about ¼ inch or less long; flowers usually many, 1 to 3 in the axil of each leaf, on short lateral shoots, fragrant, silvery like the leaves, ½ inch or more long; calyx silvery without, yellow within, the tube about ¼ inch long, the lobes ovate; fruit silvery, ⅓ to ½ inch long, oval; the nut with about 8 longitudinal ridges.

The range of this species extends from Minnesota to the Yukon, South Dakota, and Utah. In Montana it has been found at Haugan, Kalispell, Flathead Lake, West Gallatin River, Judith River, and Ross Hole; and in Yellowstone Park on Electric Peak; in British America on the Sarcee Reserve, Alberta, at Banff, and from the Grand Rapids of the Saskatchewan to the Rocky Mountains and north to 69 degrees near the Arctic Coast. It forms thickets along the 49th parallel from Red River to the Rocky Mountains, growing where no other shrubs are seen (*Macoun*). It was first collected by Meriwether Lewis and later by Nuttall on the Missouri.

PLATE 29 (p. 239) *Lepargyraea argentea* (Nutt.) Greene

Buffalo Berry from the Milk River, Montana

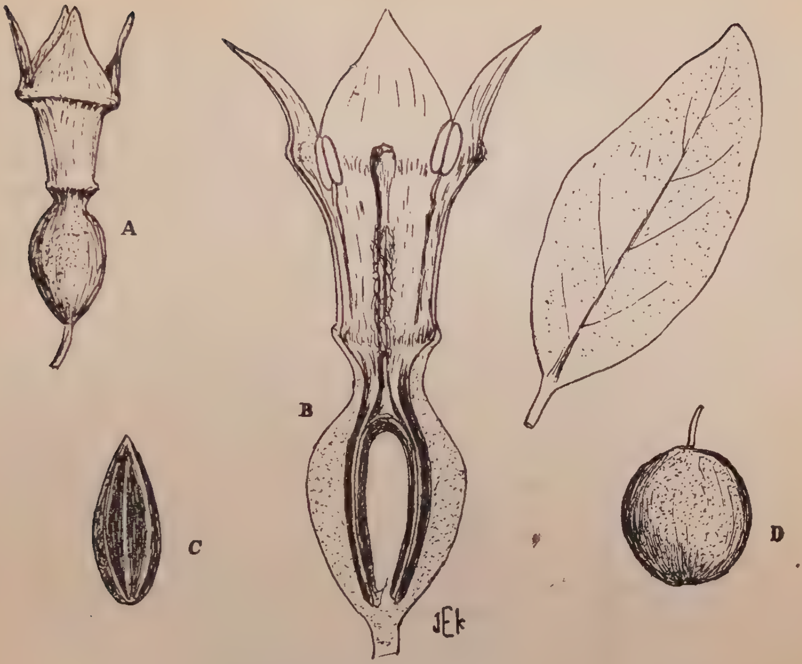

Fig. 51.—*Elaeagnus argentea* Pursh. Silverberry
Leaf natural size; *A,* flower, ×3, and *B,* same in section, ×6; *C,* nutlet, ×2; *D,* fruit, ×2.

LEPARGYRAÈA

These are shrubs covered with brown, scurfy, stellate hairs, and with opposite petioled leaves. The flowers are small, either staminate or pistillate or perfect upon the same plant, or the staminate and pistillate on separate plants, the former more numerous; the flowers are solitary or in fascicles or spikes at the nodes of the branch of the preceding season. The pistillate is surrounded by an urn-shaped elevation of the receptacle which contracts above the ovary, bearing 8 glandular lobes and 4 sepals. In the staminate flower the disk is also 8-lobed, and the stamens 8 in number, alternate with its lobes, the filaments short. The upper part of the perianth is deciduous, leaving the lower portion, which surrounds the ovary, to develop as a fleshy tissue.

Three species are known in this genus, natives of North America and the Rocky Mountains. Of these, two are found in the north. The genus is also known as *Shepherdia.*

Key to the Species of Lepargyraea

Leaves green above.................................... 1. *L. canadensis*
Leaves silver-white on both sides........................ 2. *L. argentea*

1. **Lepargyraea canadénsis** (L.) Greene

Canadian Buffalo Berry. Fig. 52

A thornless shrub reaching 9 feet in height, the stems erect, the lateral branches ascending at narrow angles from opposite sides in pairs, often angled, bark smooth, a grayish brown, the young twigs

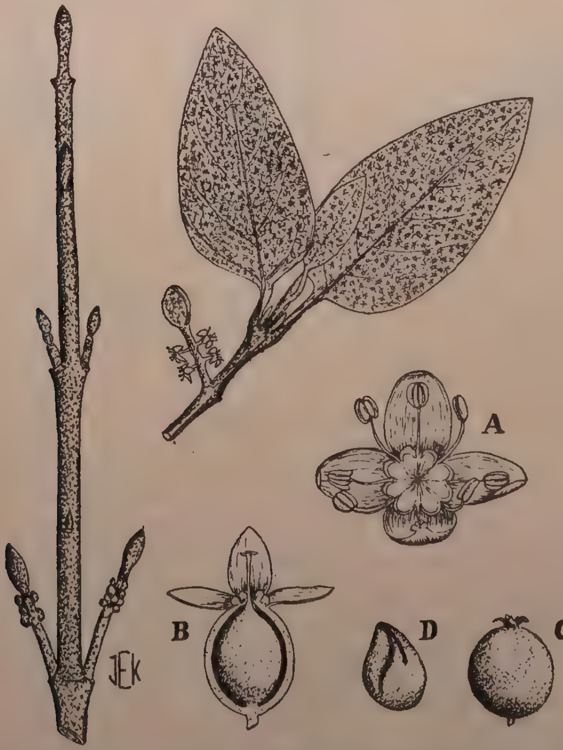

Fig. 52.—*Lepargyraea canadensis* (L.) Greene. Canadian Buffalo Berry Twig and leaves natural size; *A,* staminate flower, ×6; *B,* pistillate flower, diagrammatic; *C,* fruit, ×3; *D,* nutlet, ×5.

brown, scurfy-pubescent, leaf-scars prominent, crescentic or semicircular; terminal winter buds of two appressed young leaves, lanceolate in outline, keeled; flower buds small, spherical, sessile on short, lateral twigs; leaves mostly 1 to 2 inches long, ½ to ¾ wide, ovate or oval, the apex blunt or rounded, the base usually rounded, the margin entire, the upper surface dark green, the lower coated with rusty-silvery scale-hairs; petioles less than ¼ inch long, flowers in short spikes at the nodes, expanding with the leaves or before them; flowers over ⅛ inch broad, the sepals 4, ovate; fruit red, about ¼ inch long; nut smooth.

The distribution of *L. canadensis* is transcontinental from Newfoundland to Alaska, and south to New York, Michigan, Utah, and Oregon. In Montana it is often found in dry woods up to 6,000 to 7,000 feet, where the following localities may be mentioned: Missoula, Helena, Monida, Flathead Lake, Ross Hole, Judith River, and Bridger Mountains; in Yellowstone Park on Electric Peak; in the Canadian Rockies, in Kootenai Pass and the Sarcee Reserve, at Field, Lake Louise, and Emerald Lake.

The plant was first described by Linnaeus in 1753, under the name given above. It was also described by Nuttall in 1818 as *Shepherdia canadensis.*

2. **Lepargyraea argéntea** (Nutt.) Greene

Buffalo Berry. Plate 29

A shrub, usually thorny by the transformation of short lateral twigs, the bark on old stems rough, fissured, gray, that on younger twigs smooth, grayish-brown, the youngest twigs paler, scurfy; leaf-scars prominent; winter buds less than ¼ inch long, flattened dorsally, not keeled; flower buds in winter minute, nearly spherical, on short lateral spurs; leaves 1 to 2 inches long, ¼ to ½ inch wide, oblong or oblanceolate, rounded at the apex, narrowed at the base, margin entire, silvery-pubescent on both sides, but more so beneath; petioles about ¼ inch long; flowers fascicled at the nodes of short lateral twigs, about ⅛ inch broad; fruit ovoid, scarlet, about ¼ inch long.

The range of this species is from Saskatchewan and Alberta to Kansas, New Mexico, and Nevada. In the Canadian Rockies it forms dense thickets along Swiftcurrent Creek and Mud River. In Montana it is found near Havre, Great Falls, and Livingston, and along the Teton and Little Missouri rivers.

It is one of the most common shrubs on the Atlantic side of the Divide at lower altitudes, forming thickets on the bottom lands of the Missouri and the Yellowstone rivers and their tributaries. It is doubtful whether it occurs west of the Divide.

The berries are edible and are used by settlers in the making of jellies and conserves.

The plant was first found by Lewis and Clark, and was described by Nuttall in 1813.

ARALIÀCEAE

Ginseng Family

The Ginseng Family includes herbs, shrubs, and trees, with mostly large leaves in alternate position, though sometimes in whorls or rarely opposite. The leaves are either simple, or pinnately or palmately compound. The flowers are borne in panicles, umbels, racemes, or heads. The individual flower has an inferior ovary, formed by the radial fusion of the carpels with the tube of the calyx or receptacle, bearing at its summit 5 broad, short, and sometimes obsolete sepals, 5 petals, alternate with the sepals, and stamens usually of the same number alternating with the petals. The carpels vary from 2 to 15 in different genera, united into a compound ovary having as many chambers as carpels, with styles of the same number and distinct, surrounded by a glandular disk, which covers the top of the ovary within the circle of stamens. Each cell of the ovary is occupied by a single ovule attached at the inner angle. The fruit is known as a drupe and consists of a fleshy, sometimes dry, exterior and an interior bony portion enclosing the seeds, one in each cell, each containing a small embryo, located near the end, and a copious endosperm.

Over fifty genera are known in this family, and several hundred species, mostly natives of the tropics and the warmer regions of the world in both hemispheres. Two centers of development are to be noted, one in the East Indies, the other in tropical America, both abounding in the diverse forms supplied by the rich variety of genera and species. A few members of the family are more or less common in the northern forests of America, one of which is a shrub, common in the Northwest, but sparingly found in the Rocky Mountains within the borders of the United States. Some fossil plants of this group are known in the Tertiary of this region and elsewhere.

The *Araliaceae* are mainly plants partial to humid regions and moist habitats. While the flowers are usually perfect, their occurrence in large clusters leads to the occasional suppression of stamens or pistils and to consequent cross-pollination. This advantage is further insured by the maturing of the stamens while the pistils are still undeveloped. The massing of the small flowers and the presence of the glandular disk both suggest the probability of insect agency in pollen transfer. The seeds are apparently distributed by birds.

The plants of this group have few economic applications. The most important American member of the family is the Ginseng (*Panax quinquefolium* L.). This plant, for the roots of which there is an extensive and profitable market in the Orient, grows wild and is often cultivated in the northern Atlantic States, but is not known to occur in the Rocky Mountains. Various exotic genera are employed in ornamental planting, among the most common of which are the Ivy, a native of the Old World, and the Chinese Angelica Tree.

ECHINOPÀNAX

The plants of this genus are densely prickly shrubs, with large, palmately lobed leaves, and greenish-white flowers in large, compact clusters at the tops of the stems. Sepals are obsolete in this genus, but the petals are 5 in number, fitting edge to edge in the bud, and stamens of the same number are alternate with them, having slender filaments and oblong anthers. The pistil is composed of 2 to 3 carpels, united to form an ovary with an equal number of cells and filiform styles, each capped by a small stigma. The fruit is laterally compressed, the inner bony portion containing the seeds, the outer fleshy.

At present but a single species is known in this genus, distributed mainly through the Pacific Northwest, but found as far east as Michigan and west to Japan.

Echinopanax hórridum Dec. & Planch

Devil's Club. FIG. 53

A shrub, 4 to 12 feet in height, little branched, the stems cane-like, more or less crooked, densely beset with slender, yellow spines

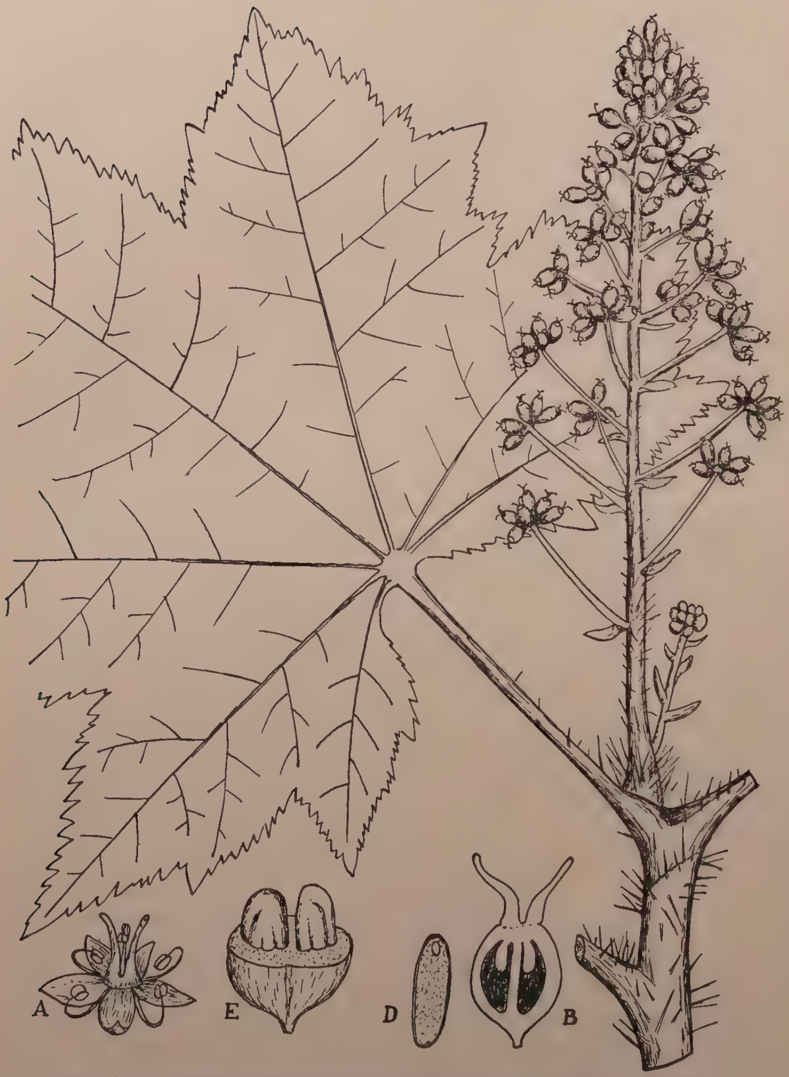

FIG. 53.—*Echinopanax horridum* Dec. and Planch. Devil's Club

Shoot about one-half natural size; *A*, flower; *B*, pistil in section; *C*, fruit containing two nutlets; *D*, seed in section. After Hooker.

⅛ to ½ inch long, extending also to the leaves and inflorescence; leaves near the top of the stem, often reaching a foot in breadth, rotund in form, usually with 5 large veins radiating from the base of the blade into the 5 prominent lobes, the base of the leaf cordate, the margin serrate with sharp teeth, the lower surface pubescent with scattered curled hairs chiefly along the veins; inflorescence narrowly conical, terminal, 4 to 6 inches long, the axis woolly, bearing lateral axes, on the ends of which are numerous small flowers on equal pedicels; flowers greenish, petals pointed; fruit scarlet, flattened, about ¼ inch long, bearing 2 persistent styles at the apex, and containing 2 seed-like nuts.

This conspicuous plant is common in the canyons of Kootenai County, Idaho, and is found in Montana at Columbia Falls and elsewhere in moist gulches, very common on the west side of Glacier Park. In the Canadian Rockies, it is abundant from the source of the Columbia southward, but rare on the east side of the Divide; it is plentiful in Peace River Pass and along the base of Mount Selwyn, and abundant in the Selkirk Range.

It occurs especially in moist woods along streams and about springs, and notwithstanding the discomforts of contact, a very strikingly prominent and beautiful plant. It reaches its best development in the Cascade and Coast ranges from Oregon northward.

CORNÀCEAE

DOGWOOD FAMILY

The members of the Dogwood Family are mostly shrubs or trees, with simple, usually opposite leaves. The flowers are small, 4-parted, and are borne in heads or in open clusters, in some exotic species solitary. The ovary is inferior. The receptacle in the form of a sac encloses the carpels and is fused with them to the top of the ovary, where its margin bears the sepals, petals, and stamens, each 4 in number and in alternating position. The sepals are small, often vestigial, the petals much longer than the sepals and valvate. The stamens have straight filaments and short ovoid anthers. Within the circle of the stamens is a thick disk, completely covering the top of the ovary, and surrounding the straight style, which bears at its summit an entire or slightly lobed stigma. The ovary is composed usually of 2 carpels united to form 2 cells, each containing a single ovule which becomes a seed, containing endosperm and an embryo with two leafy cotyledons. The fruit has a soft, fleshy exterior and a bony inner layer enclosing the seeds. At the apex of the fruit are the scars of the perianth.

The genera of this family are a score more or less, and the species from eighty-five to one hundred. They occupy the temperate regions of the world both north and south in the Old and the New Worlds. In Asia is found the greatest development of genera and species. In the United States three genera are well known, of which *Cornus* alone occurs in the Rocky Mountains within our range. Fossil members of the group are found in the Tertiary strata of Spitzbergen, Greenland, and Alaska, and various other parts of the world.

The dogwoods have few uses, though the wood of some species is very hard and the bark often contains a bitter and astringent alkaloid sometimes used in medicine.

DOGWOODS

Cornus

The species of *Cornus* are shrubs or trees, usually with opposite leaves, mostly entire. The flowers are small and occur in heads or open clusters. The receptacle is top- or bell-shaped, its margin bearing 4 minute sepals and filled above about the style with the thick disk. The petals are 4, valvate in the bud, the stamens 4 and the ovary 2-celled, formed of 2 carpels, the ovules 1 in each cell. The fruit is ovoid or globular, the stone 2-celled and 2-seeded.

Some authors cite as many as forty species of *Cornus,* but in the Rocky Mountains not more than five or six can be recognized with certainty. They are with one exception natives of the North Temperate Zone and are, by one species or another, commonly represented in all the wooded regions of the United States.

A number of species are ornamental in flower and fruit, especially the so-called Flowering Dogwoods of the Atlantic and Pacific coasts, and are planted in parks and gardens, as are also some forms introduced from Asia. One or two species are small herbaceous plants of the northern woods.

Cornus stolonífera Michx.

Dogwood. Fig. 54. Plate 30

A shrub, 6 to 15 feet high, with slightly curved twigs set opposite on the branch, bright red or reddish-brown, changing to gray on

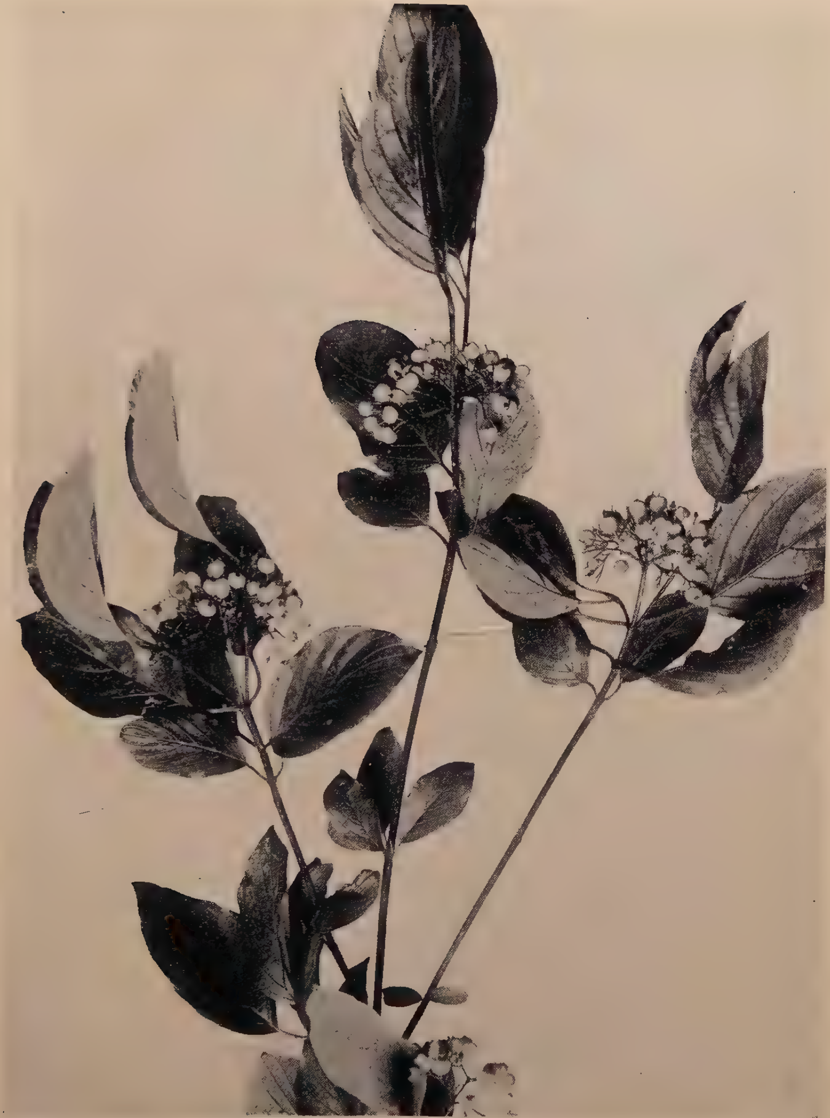

PLATE 30 (p. 244) *Cornus stolonifera* Michx.

Dogwood. Leaves and fruit in August, from Missoula, Montana

older stems, the youngest shoots covered with appressed hairs and slightly flattened in the plane of the leaves; lenticels few on the youngest twigs, but on older ones large and numerous, white, oval, and irregular; leaf-scars encircling the twig, giving it a jointed appearance; winter buds covered with gray or brown, stiffly appressed hairs; the vegetative slender, oblong, the scales valvate; the terminal buds often fertile, inflated, the dormant inflorescence partly exposed between the separated bud-scales; leaves 1 to 4 inches long, ½ to 1½ inches wide, varying from elliptical to lanceolate, the apex short taper-pointed or merely sharp-pointed, the base rounded or narrowed, the margin entire, both surfaces bearing appressed straight hairs, dark green above, paler beneath; petioles usually ¼ to ½ inch long; inflorescence terminal on leafy shoots of the season, rounded, 1 to 2 inches broad, its branches pubescent, the flowers white, about ¼ inch in diameter; ovary oval, with a few appressed hairs; sepals minute, best seen on the flower buds; petals lanceolate, about ⅛ inch long; stamens longer than the petals, their filaments straight and anthers large; disk a fleshy cushion about the base of the style, which is about two-thirds as long as the stamens; fruit oval, about ¼ inch long, white or bluish, with fleshy exterior; nut ⅛ inch or more broad, its greatest diameter longitudinal or transverse, grooved on the edge.

This species is found from the Atlantic to the Pacific: on the Atlantic Coast from Nova Scotia to Virginia, and on the Pacific from Alaska to California. In the Rocky Mountains it extends south to New Mexico and Arizona and Chihuahua. It is one of the most common shrubs in the northern Rocky Mountains, where the following localities may be noted: in the Canadian Rockies on the Sarcee Reserve, at Emerald Lake, and in the valley of the Mackenzie River; in Idaho at Lewiston, Boise, and Twin Falls; in Montana, near Missoula, Helena, Bozeman, Red Lodge, and Baker; in Yellowstone Park on Gardner River.

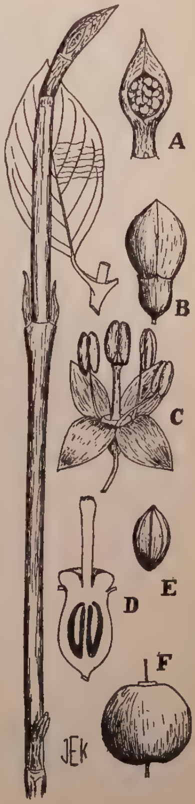

FIG. 54.
Cornus stolonifera Michx. Dogwood

Twig in winter condition, natural size; leaf about one-fourth natural size; *A,* terminal bud, ×2; *B,* flower bud, ×5; *C,* flower, ×3; *D,* pistil, ×5; *E,* nutlet, and *F,* fruit, ×2.

The description of *Cornus stolonifera* dates from the work of Michaux in 1803. In 1890 Coulter and Evans, mainly from material which came from the region of the Great Lakes, described a species which they named *C. Baileyi,* separated from *C. stolonifera* on the basis of the woolly pubescence on the leaves, and the character of the nut, which is said to be broader than long. Rydberg in 1904 made a still further segregation in describing *Svida* (*Cornus*) *interior* and *S. stolonifera riparia,* based upon pubescence of leaves and twigs and the relative dimensions of the nut. The former Nelson (1909) regards as synonymous with *C. Baileyi.* Howell (1903), however, in describing *C. stolonifera* Michx. states: "stones very variable from ovate and pointed, scarcely flattened, higher than broad, to more or less flattened, broader than high, these extremes completely connected by intermediate shapes and dimensions, all with more or less furrowed edge." Rydberg (1917) states that *S. instolonea* A. Nels. is less pale beneath than the eastern *C. stolonifera,* but a comparison of some material from Vermont and Massachusetts and from the west shows the reverse to be the case in the specimens examined. The evidence available shows the great variability in the characters employed in distinguishing between the species, they are therefore considered collectively under the name *C. stolonifera.*

The large Flowering Dogwood (*Cornus Nuttallii*), though not reported in the Rocky Mountains, probably occurs in the northern valleys on the western slope. It is distinctly a tree, at least in favorable situations, and is characterized conspicuously at the time of flowering by the expansion of the scales, which enclose the flower cluster into a large, white, corolla-like involucre of 4 to 6 members. This tree is especially common west of the Cascades from British Columbia to California.

ERICÀCEAE

HEATH FAMILY

The plants of the Heath Family are trees or shrubs, some low, bushy, and vine-like. The leaves are simple, without stipules, usually alternate and often leathery and evergreen and more or less rolled on the margin. The flowers, usually borne in clusters, are mostly perfect, and the petals are united into a cup-like or urn-shaped corolla, or sometimes separate. Sepals, petals, and stamens are inserted below the ovary, each usually independent, although the stamens are sometimes inserted on the corolla near its base. The anthers of the group open by a terminal pore, which in the various forms undergoes modification, in the extreme form approaching the longitudinal openings usual in other plants. The various members of the flower are usually arranged in 5 whorls of 5 each, or sometimes 4, in alternating positions; thus the sepals are 5, the petals 5, the stamens 10 in two series, the carpels 5, united into a 5-celled ovary, single style and small cap-like stigma. The seeds, from one to many in the different genera, are attached to the central axis, either directly or on special placental outgrowths from it. The fruit is a capsule or berry, or the ovary wall is differentiated into two layers, the outer succulent and fleshy, the inner hard and bony, forming a drupe. When capsules are formed they open by longitudinal clefts either into the cells or between them. The seeds are small, with membranous coats and straight embryo embedded in endosperm.

There are from fifty to sixty genera in the Heath Family and over one thousand species. The family is one of very wide distribution and peculiar habits. The genera are found from the Arctic to the Antarctic regions and in all parts of the world. The heaths are represented in the northern Rocky Mountains by about ten genera, but not many species.

In their biological features they are plants of peculiar interest. Through the tropics they are found from low moist lands to the tops of high mountains. In northern latitudes they are often plants of cold bogs or in bleak and exposed situations; again they are found only in open woods or in forests at high elevations, the different genera often showing marked inclinations to special conditions. The organization of the flower, the peculiar mechanism of the stamens, and the secretory tissues indicate a relation to insect visitation in the matter of pollen transfer.

Besides the edible fruits of some species and the medicinal properties of others, a number of the plants from this family are cultivated as ornamentals, and numerous hybrids are known. Among those most widely cultivated are *Rhododendron, Arbutus,* and *Erica.* The Scotch Heather (*Calluna*) belongs to this group.

KEY TO THE GENERA

Fruit a dry capsule
  Flowers with separate petals........................ *Ledum*

- Flowers with petals or less united
  - Leaves deciduous .... *Menziesia*
  - Leaves evergreen
    - Leaves alternate
      - Leaves linear
        - Leaves about ½ inch long.............. *Phyllodoce*
        - Leaves about 1 inch long.............. *Andromeda*
      - Leaves broad
        - Corolla large, bell-shaped.............. *Rhododendron*
        - Corolla small, urn-shaped.............. *Chamaedaphne*
    - Leaves mostly opposite
      - Leaves not scale-like
        - Leaves oval, about 1 inch long......... *Kalmia*
        - Leaves oblong, small.................. *Loiseleuria*
      - Leaves 4-ranked, scale-like.............. *Cassiope*
- Fruit berry-like
  - Calyx enclosing the fruit.......................... *Gaultheria*
  - Calyx not enclosing the fruit........................ *Arctostaphylos*

LÈDUM

Labrador Tea

These are shrubs with tall or depressed stems. The leaves are alternate, leathery, broad or narrow, fragrant when bruised, often with rolled margin and petiolate. The handsome flowers, which appear in early summer, are white, perfect, clustered at the top of the stems, and borne on elongated equal pedicels from a scaly bud. The saucer-shaped calyx is divided into 5 lobes, often as broad as long, alternate with the 5 spreading petals, which in this genus are separate. The stamens are 5 to 10, erect or inclined, with slender, mostly pointed filaments, and oblong or oval anthers, which are shorter than the filaments. The pistil consists of an ovary of 5 cells, surmounted by a straight style, somewhat enlarged toward the top, where it bears a ring-like stigma. The fruit is an oval or nearly globose capsule, faintly 5-lobed, splitting from the base through the partitions into 5 valves, the open capsule directed downward by the sharp curving of the pedicel.

The species known to the genus are all found in North America, and one is circumpolar. They are plants of the northern latitudes, and in the southern part of their range confined to higher altitudes.

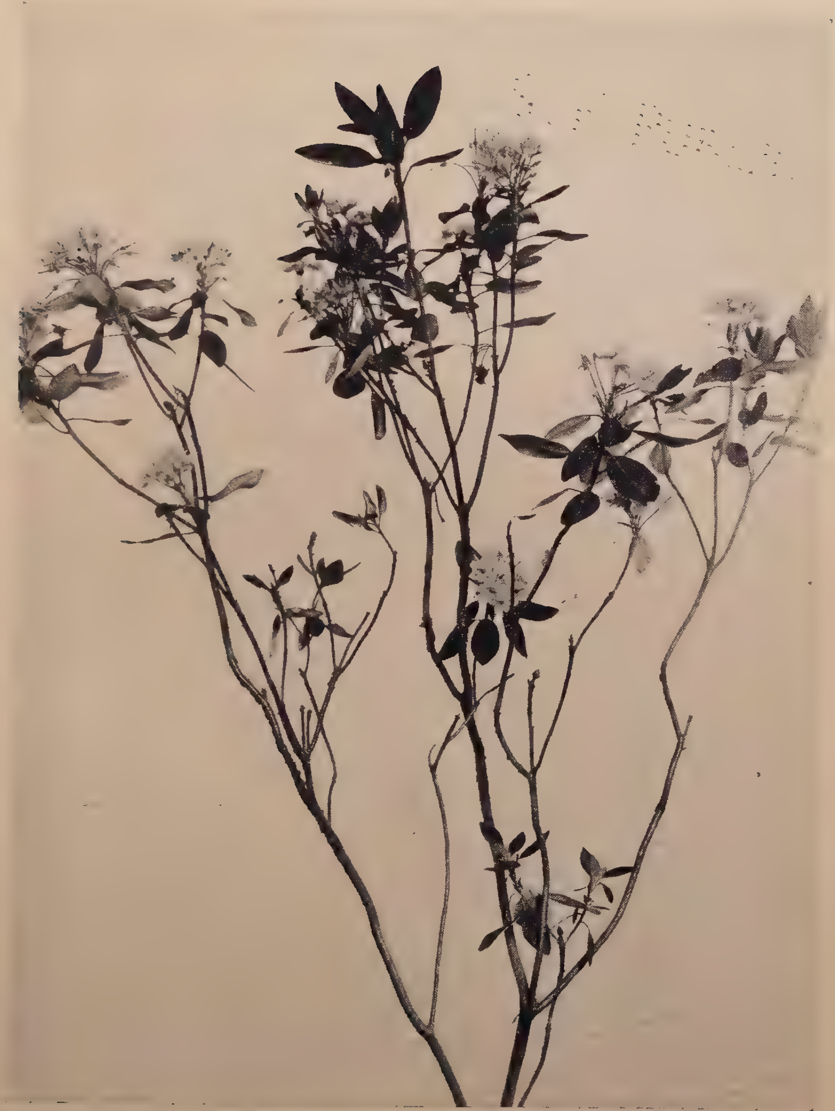

PLATE 31 (p. 249) *Ledum glandulosum* Nutt.

Western Labrador tea from the Bitterroot Mountains

The leaves of *Ledum* contain a volatile oil with narcotic properties, sometimes used medicinally and in Europe in the brewing of beer. The leaves of *Ledum groenlandicum* are said to have been used during the War of Independence as a substitute for tea; hence the name "Labrador Tea." *Ledum palustre* L. is known as Wild Rosemary. The species are sometimes planted as ornamentals.

Key to the Species of Ledum

Leaves not hairy beneath.............................. 1. *L. glandulosum*
Leaves felted woolly beneath
  Leaves oblong or broadly elliptical.................. 2. *L. groenlandicum*
  Leaves linear .... 3. *L. palustre*

1. **Ledum glandulósum** Nutt.

Western Labrador Tea. Fig. 55. Plate 31

A shrub, 1 to 3 feet high, leafy mostly near the ends of the narrowly divergent twigs, the shoots of the season finely pubescent, becoming smoother with age, changing to red and finally gray by the exfoliation of the outer layers; leaf-scars kidney-shaped; terminal winter buds broadly ovate, about ⅛ inch in diameter, reddish-gray, pubescent, enclosed by 2 to 3 broad scales; leaves ½ to 2 inches long, ¼ to ¾ inch wide, ovate, oval, or oblong, sharp or blunt at the apex, mostly rounded at the base, smooth and green above, pale and thickly dotted with resin glands beneath, the margin entire, not rolled; petioles ¼ to ½ inch long; inflorescence usually terminal on the ultimate erect twigs, 1 to 2 inches broad, rounded, pedicels about 1 inch long, finely coated with white hairs, each flower about ½ inch broad; calyx small, the lobes ovate, ragged at the apex; petals oval or oblong, white, about ¼ inch long; stamens 10,

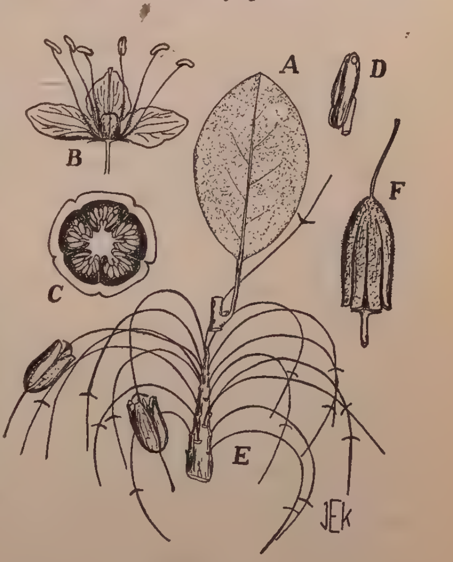

Fig. 55.—*Ledum* sp. Labrador Tea *A–D, L. glandulosum* Nutt. Leaf natural size; *B*, flower, ×2; *C*, transverse section of ovary, ×12; *D*, anther, ×10. *E–F, L. latifolium* Ait., fruiting branch and fruit, ×1½ and 3, respectively.

exceeding the petals, filaments distinctly bearded below the middle; pistil shorter than the petals, the style straight and the globose ovary glandular-pitted; capsules broadly oval, about ⅙ inch in diameter.

This is especially a species of the Northwest, ranging from British Columbia to California and eastward to the Rocky Mountains from Alberta to Wyoming. In the Canadian Rockies it is found at Mount Aylmer and Devil's Lake; in Montana, at altitudes above 4,500 feet, as at Lolo Hot Springs and elsewhere in the Bitterroot Mountains, in Park and Deer Lodge counties, near Granite and Pony, and in the Belt Mountains; in Yellowstone Park, on East De Lacy Creek.

Ledum glandulosum is a plant of the open wooded hillsides about Lolo Hot Springs, where it was observed by the writer, and where it appears in bloom about the first of July as one of the most handsome mountain shrubs.

2. **Ledum groenlándicum** Oeder

Labrador Tea

An erect shrub, 1 to 4 feet high, the rusty-colored shoots of the season covered with a loose coating of long curled hairs, leafy toward the summit of the slender forking twigs, bark gray or brown; terminal winter buds ¼ inch or more thick, covered with numerous round reddish scales; leaves 1 to 2 inches long, ¼ to ½ inch wide, oblong or narrowly elliptic, blunt at both ends, nearly sessile, the margin strongly rolled toward the lower side, the upper surface roughened by elevations between the veinlets, sparsely hairy and glandular and red with densely matted hairs beneath; the inflorescence a terminal rounded cluster 1 to 2 inches broad, the pedicels ½ inch or more in length, the flowers about ½ inch broad or less, calyx small, its lobes broad; petals oblong, or obovate-oblong, ¼ inch long or more; stamens 5 to 7, filaments mostly smooth; capsules oblong or oval, ¼ inch or less in length.

This plant is transcontinental in North America from Greenland to British Columbia, and south to Pennsylvania, Wisconsin, Alberta, and Washington. It is found usually in bogs, with a more southerly range than *L. palustre*.

3. **Ledum palùstre** L.

Wild Rosemary

A shrub, 6 inches to 2 feet high, with ascending branches and slender twigs, the twigs of the season covered with brick-red hairs, those of former years becoming gray, the bark exfoliating slightly; leaves ½ to 1½ inches long, commonly less than ⅛ inch wide, linear, blunt at the apex and base, the margin strongly rolled toward the lower side, the upper surface green, almost hairless, roughened by elevations between the veinlets, the lower densely coated with matted red hairs; petioles very short; flowers in terminal rounded clusters ½ to 2 inches broad, the pedicels ½ to ¾ inch long, increasing somewhat in fruit and, like the stems, covered with red hairs, the flowers about ⅓ inch broad; calyx minute, its lobes broad; petals white, oval, ⅛ inch or more long; stamens 10, longer than the petals, slightly hairy toward the base; pistil shorter than the petals, the style straight, the globular ovary covered with greenish-yellow glands; capsule oval, less than ¼ inch high, splitting from the base into 5 valves, the style persistent.

This plant is a native of bogs from Newfoundland to Alaska and across Europe and Asia. While not reported from Montana it may be found in the northern ranges, since it has been reported from Alberta, between Banff and Anthracite.

The variations which this plant exhibits in vegetative habit and leaf characters have led to the description of varieties (*decumbens, angustifolium,* etc.) which in the cases cited have subsequently been given specific distinction under the name *L. decumbens* (Ait.) Lodd., a form of *L. palustre* regarded as transcontinental in North America, but not circumpolar.

MENZIÈSIA

The plants of the genus *Menziesia* are shrubs of erect or spreading habit, with deciduous leaves on short petioles, the blade thin, broad, and usually entire. Flowers appear with the leaves from buds on the twigs of the preceding season, in clusters terminating the branches, nodding on slender pedicels, which become erect in fruit. The calyx is shallow or flat, entire or slightly divided into 4 bristly lobes. The corolla is variously colored and shaped and varying in form from cylindrical to urn-shaped or globular. Eight stamens are included within the tube of the corolla, the filaments jointed, sometimes hairy at the base, the anthers narrow and opening by an apical pore. The pistil consists of 4 carpels united to form a 4-celled, ovoid ovary, surmounted by a short columnar style and flat-topped stigma. The fruit is a dry, thick-walled capsule, which opens by 4 valves to release numerous small seeds.

Menziesia is a genus of about seven species, three of which belong to North America, one on the Atlantic Coast, and two in the Rocky Mountains and the Pacific Northwest.

They are not attractive plants and have no known points of special interest, except that one or two species are reported as poisonous to stock. The genus was named for Archibald Menzies, surgeon on Vancouver's voyage, 1791–1795, who brought the original material from the northwest coast.

Menziesia ferrugínea Smith

Fig. 56

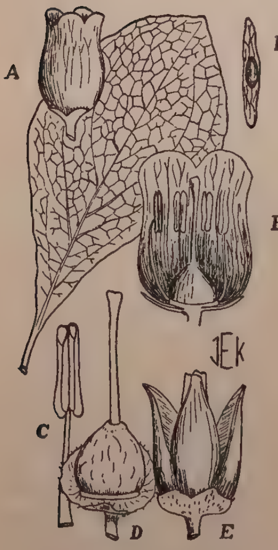

Fig. 56.—*Menziesia ferruginea* Smith

Leaf somewhat over natural size; *A*, flower, ×2; *B*, same in section, ×3; *C* and *D*, stamen and pistil, ×7; *E*, fruit, ×3; *F*, seed, ×8.

An erect shrub, 3 to 6 feet high, leafy toward the tips of the branches, the young twigs green and finely pubescent, later exfoliating a thin outer layer, leaving smooth round branches with grayish-brown bark; winter buds ovate, about ¼ inch long, plump, finely pubescent, the 4 to 5 scales exposed, about as long as the bud; leaves 1 to 2 inches long, ½ to 1 inch wide, oblanceolate or obovate, the apex rounded or acutely or obtusely pointed, often with a short glandular point at the end, the base usually contracted to an angle, margin entire or wavy and set with hairs or cilia, the upper surface green, bearing scattering appressed hairs, pale beneath and slightly pubescent, especially along the veins, flowers few, usually in the forks of the young shoots, nodding on slender pedicels, which are more or less covered with hairs and glands; calyx very small, merely supporting the base of the corolla, the margin of the sepals bearing gland-tipped hairs; corolla ovoid or urn-shaped, ¼ to ⅜ inch long, white, petals round; stamens shorter than the corolla; capsule ovoid, about ¼ inch long, splitting down from the top through the partitions into 4 valves, on erect pedicels.

This species has a range from the Pacific Coast to Lake Superior and from British Columbia to Oregon; in the Rocky Mountains, from Yellowstone Park northward. In Montana it is reported from Glacier Park, Columbia Falls, McDonald Peak in the Mission Mountains, South Fork of the Lolo, Deer Lodge, Upper Marias Pass, Sun River, and elsewhere; in the Canadian Rockies at Field, Glacier, Lake Louise, Emerald Lake, in the country north of Smoky River and in Kicking Horse, North and South Kootenai, and Crows Nest passes.

Two species of *Menziesia* are described from the Northwest, *M. glabella* Gray and *M. ferruginea* Smith. Nelson (1909) considers them the same, while Small in the *North American Flora* (1914), though distinguishing between the two, assigns *M. ferruginea* a range west of the Rocky Mountains, from Alaska to British Columbia and Oregon. Rydberg, however, (1917) defines alike the ranges of the two species, viz., from Oregon to Montana and Wyoming and north to British Columbia or Alaska. In view of the slight and variable characters upon which the distinction is based and the difficulty of separating the two when material is available for comparison, it seems best to consider the Rocky Mountain material as belonging to a single species. While the Rocky Mountain material seems less strigose than that from the coast, this character not only intergrades but varies on the same plant.

PHYLLÓDOCE

Mountain Heath

The species of *Phyllodoce* are low shrubs, growing in mats or tufts, with small, narrow, evergreen leaves, crowded and alternate, and with revolute margins. The flowers, nodding on slender pedicels at the ends of the branches, occur in small, umbel-like clusters. The calyx with 4 to 6 narrow, slightly united lobes is persistent on the fruit and often glandular. The corolla, white or colored, has an ovoid tube with 4 to 6 lobes, which may be very short. The stamens are 8 to 12, either projecting from the mouth of the corolla tube or wholly included in it, have filaments sometimes pubescent, and oblong anthers, opening by a pore at the top. The pistil is composed of 4 to 6 carpels, the ovary globular or shorter than broad, with 4 to 6 cells, slender style, and minute stigma. The oval or globose capsule splits down from the top by as many valves as there are cells and releases small oval seeds with a thin, membranous, wing-like border.

About six species of *Phyllodoce* are known. They belong to the Arctic regions of the Old and the New World and are found ranging southward along the high mountains. Two or three species are reported from the northern Rocky Mountains.

These plants, sometimes known under the name *Bryanthus,* are very attractive by reason of their handsome delicate flowers, which are often borne in great profusion. They are commonly called Mountain Heath.

KEY TO THE SPECIES OF PHYLLODOCE

Corolla bell-shaped	1. *P. empetriformis*
Corolla ovoid	
Corolla yellow	2. *P. glandulifera*
Corolla purple	3. *P. coerulea*

1. Phyllodoce empetrifórmis (Smith) Don

Purple Mountain Heath. FIG. 57

A low, matted, spreading shrub, the twigs ascending to a height of 6 to 8 inches, the stems stout, dividing upward into narrowly diverging slender twigs, which are usually bare of leaves below 3 to 4 inches from the tips, pubescence wanting, the leafless parts roughened by the numerous slightly elevated leaf-scars, and the older branches covered with a thin, gray, scaly bark; leaves ¼ to ½ inch long, linear, blunt at the apex, sessile, the margin often minutely serrulate, smooth; flowers several or many from the tops of the shoots, on slender, glandular pedicels, about ¼ inch long, nodding on pedicels which become straight in fruit; calyx about ⅓ as long as the corolla, its lobes ovate, round-pointed, tinged with red; corolla about ¼ inch long, bell-shaped, deep pink or purple, the petals rounded, much shorter than the tube; stamens shorter than the corolla tube; capsule globular, less than ⅛ inch in diameter.

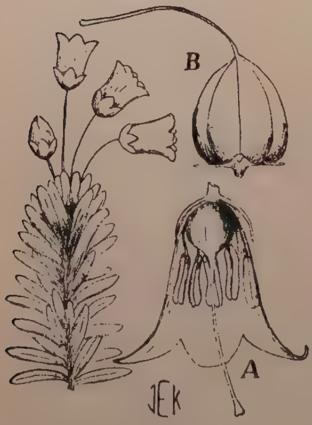

FIG. 57.—*Phyllodoce empetriformis* (Smith) Don Purple Mountain Heath

Shoot natural size; *A,* section of flower, ×4; *B,* fruit, ×4.

The distribution of this species is from Alaska to California and in the Rocky Mountains to Wyoming and Colorado. The following localities may be mentioned: in the Canadian Rockies to latitude 50° N., at Lakes Louise, Agnes, and O'Hara, and in Yoho Valley; in Idaho on Striped Peak near Wallace, and in the Trinity Lake region; in Montana in Upper Marias Pass, Belt Mountains, East Boulder Plateau, Old Hollowtop near Pony, and near Granite and Columbia falls; in Yellowstone Park near the Upper Falls and Stinking Water.

This is a shrub of the high mountains in the southern part of its range, reaching an altitude in Montana of 10,000 feet or more, and usually not lower than 6,000 to 7,000. It is one of the beautiful, heath-like plants, forming mats of green and purple on exposed ridges and peaks.

2. **Phyllodoce glandulífera** (Hook.) Cov.

Yellow Mountain Heath

A tufted or matted shrub, reaching a height of 12 inches, often with a brush-like assemblage of branches, leafy to 3 to 4 inches back from the tips, the twigs roughened by numerous leaf-scars, on older branches the bark thin, gray, and slightly rough; leaves ¼ to ½ inch long, linear; usually bluntly pointed at the apex, nearly sessile at the base, the margin finely serrate with microscopic teeth, slightly glandular when young, becoming smooth with age, distinctly grooved above, dark green on both sides, except for a white streak beneath; flowers yellow, on thickly glandular pedicels about ½ inch long, few or numerous from the ends of the twigs; calyx somewhat less than ¼ inch long, densely glandular, the sepals sharp-pointed; corolla ovoid, ¼ to ⅓ inch long, pubescent; stamens shorter than the tube; capsule globular, about ⅛ inch in diameter, pubescent.

The range of *P. glandulifera* is from Alaska to Oregon and the Rocky Mountains. In British America it is found in Kicking Horse and South Kootenai passes at an altitude of 7,000 feet, and at Lake Louise and Glacier, and at various other stations south of latitude 56 degrees. In Montana at altitudes of 7,000 to 10,000 feet it is found in swamps and on mountain sides, and the following localities may be mentioned: Pony Mountains, East Boulder Plateau, and Gallatin Peak.

Hybrids have sometimes been cited as occurring between this species and *P. empetriformis,* where they grow together, and these have been described as *P. hybrida* Rydb. and *P. intermedia* (Hook.) Rydb., differing from the parent forms in the shape and the color of the corolla.

3. **Phyllodoce coerùlea** (L.) Bab.

Mountain Heath

A shrub of low and matted form, the branches ascending, 4 to 6 inches high, twigs slender, tufted, leafy for 2 to 3 inches from the tip, where bare roughened by close-set leaf-scars, gray or dark-colored; leaves ¼ to ⅓ inch long, linear, blunt at the apex, narrowed to the almost sessile base; margin minutely serrulate, hairless, except occasional glands on the marginal teeth, grooved above and white along the midrib beneath; flowers few from the ends of the branches, pedicels and calyx glandular pubescent, the former ¾ inch long, elongating in fruit; sepals about ⅛ inch long, sharp-pointed; corolla pink or purple, ovoid or urn-shaped, ¼ to ⅓ inch long, the petals very short, rounded; capsule erect, globular, about ⅛ inch thick.

While this plant is not known to occur in the Rocky Mountains, it seems to be completely circumpolar in its distribution, and its presence in New England and Alaska renders it probable that it will sooner or later be found on some of the high peaks of the northern chains.

ANDRÓMEDA

A smooth, branching, or sometimes simple shrub of low stature, with alternate, small, evergreen leaves, with rolled margins and white beneath. The flowers are perfect and appear in small clusters at the tops of the shoots. The calyx is star-shaped, with 5 pointed lobes, about equaling the tube in length. The urn-shaped corolla is white or pink, the teeth broad and recurved. Ten stamens are included within the corolla, their filaments broadened at the base, tapered to the summit, the oval anthers each with a slender appendage at the top, and a small round pore through which the pollen is released. The ovary is 5-celled, seated on a 10-lobed disk, the style simple, straight, the stigma entire. Numerous ovules are borne in each of the 5 cells of the ovary. The fruit is a nearly globose, 5-angled capsule, opening by clefts from the top into the cells, each valve slightly split at the top. Many small, oval, smooth, and shining seeds are borne in the capsule.

Two species of *Andromeda* are known, but the genus is found around the world from well within the Arctic Circle to much more temperate latitudes, along the mountain ranges. From numerous fossils assigned to this genus from the Tertiary, it may be concluded that the Andromedas were much more abundant in former times.

Andromeda polifólia L.

Andromeda. Fig. 58

A shrub, 1 to 3 feet high, erect or more or less procumbent, rooting along the stems, the branches slender, smooth, brown, leaf-scars prominent, the axillary buds minute, with thin papery scales; leaves ¾ to 2 inches long, mostly less than ⅛ inch wide, linear or oblong, apex sharp, often ending in a bristle-like tip, narrowed to the almost sessile base, the margin strongly revolute, surface dark green above, covered with a whitish bloom beneath; flowers few, nodding on slender pedicels at the ends of the branches, calyx lobes ovate or triangular, sharp; corolla ovate, dilated below, narrowed above, about ¼ inch long; capsule globose, ⅛ inch or more in diameter, the style persistent.

The distribution of this species is circumboreal; in North America it extends from Labrador and Newfoundland to Alaska and south to New Jersey, Pennsylvania, around the Great Lakes, and to Washington, Idaho, and probably Montana.

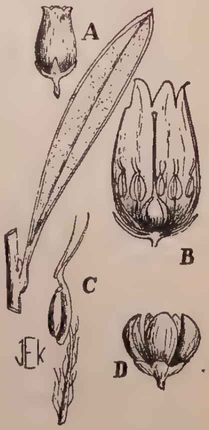

Fig. 58.—*Andromeda polifolia* L. Andromeda

Leaf and flower, *A*, natural size; *B*, section of flower, ×2; *C*, stamen, ×6; *D*, fruit, ×2½.

RHODODÉNDRON

The rhododendrons are shrubs, seldom trees, with evergreen or deciduous leaves, alternate, petioled and entire. Flowers appear in terminal, usually rounded clusters, or in smaller, lateral groups or single, mostly irregular by a one-sided development, though sometimes weakly so, with 3 upper and 2 lower petals, the calyx 5-parted, often very small, the corolla saucer- or bell-shaped or funnelform, usually with 5, but sometimes with more, petals, the stamens 5 to 10 as a rule, the anthers opening by pores at the apex, from which the pollen emerges in thready masses, filaments more or less elongated, unequal, curved upward toward the end.

The pistil, consisting of from 5 to 10 carpels, is differentiated into an oblong ovary of 5 to 10 cells, a slender, deflexed style, and small, knob-like stigma. The fruit is a dry capsule, opening by as many valves as there are chambers, by longitudinal cleavage from the apex. The seeds are numerous and minute.

The genus *Rhododendron* contains about three hundred and fifty species of wide geographic distribution through the colder and temperate regions of the Northern Hemisphere. Their greatest center of distribution is in Western China and the Himalayas, whence they extend through the Malay Peninsula and the sea islands to Australia, New Guinea, and the Philippines. There are about sixteen species in North America, of which one belongs to the northern Rocky Mountains.

The scope of the genus is variously regarded by different authors. It is here treated in the inclusive sense, following Engler and Prantl, Rehder, and others, and includes *Azalea,* which is separated from the group by some writers mainly on the basis of its deciduous leaves. Several other segregations have been made, including *Azaleastrum,* proposed by Rydberg in 1900 to designate the Rocky Mountain plant described below. Inasmuch as conservative usage retains the name *Rhododendron* and its wider popular use makes it advantageous, it is employed here.

There are few groups more widely favored in ornamental planting than the rhododendrons. Grafting, hybridizing, and selection of native and exotic species have brought into cultivation an extensive array of hardy and beautiful shrubs throughout the world.

KEY TO THE SPECIES OF RHODODENDRON

Leaves 1 to 3 inches long.................................. 1. *R. albiflorum*
Leaves ¼ to ½ inch long.................................. 2. *R. lapponicum*

1. **Rhododendron albiflórum** Hook.

White Rhododendron. FIG. 59

A shrub, 1 to 6 feet in height, with round stems and firm, smooth, gray bark on older stems, the twigs stout, the youngest shoots covered with long, appressed reddish-brown hairs, leaf-scars semicircular or triangular; terminal winter buds about ¼ inch long, ovate or oblong, the exposed scales few, nearly as long as the bud; leaves 2 to 3 inches long, ½ to 1 inch wide, oval or elliptic, usually forming an acute angle at base and apex, with slightly undulate margins, the upper surface dark green, bearing sparse, long, appressed, reddish hairs, the lower surface a bright green, nearly smooth; petioles less than ¼ inch long; flowers few, solitary, emerging from lateral buds below the shoots of the season, white, about 1 inch broad; sepals oblong, ¼ to ½ inch long, blunt, finely pubescent; corolla tube broadly bell-shaped, about ¼ inch long; capsule ovoid, about ⅓ inch long, pubescent.

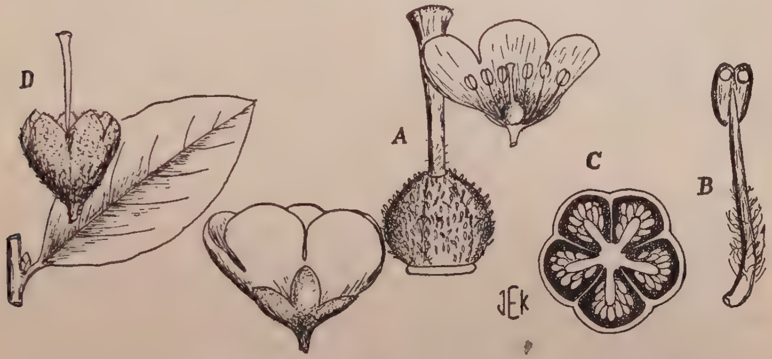

FIG. 59.—*Rhododendron albiflorum* Hook. White Rhododendron
Leaf and flowers natural size; *A*, pistil, and *B*, stamen, ×4; *D*, calyx after shedding of corolla, ×2; *C*, transverse section of ovary, ×6.

The range of *R. albiflorum* reaches from British Columbia to Oregon and Rocky Mountains as far south as Montana, where it occurs on McDonald Peak in the Mission Mountains, at Tin Cup Lake in the Bitterroot Range, and doubtless elsewhere; in the British Rockies, in the main range at high elevations, much lower in the Selkirks, in Crows Nest, North Kootenai, Pine River, and Kicking Horse passes, and Yoho Valley, and near Lake Louise and Emerald Lake.

2. **Rhododendron lappónicum** (L.) Wahl

Lapland Rose Bay

A low, prostrate shrub, with branches rising to a height of a foot or less, stout, crooked, and rather rigid; leaves ¼ to ½ inch long, usually oval, rounded or narrowed at the base, rounded or blunt at the apex, margin entire, both surfaces minutely pitted, the pits occupied by brownish resin glands, dark green above, a rusty brown beneath, almost sessile; flowers few, from the ends of the branches, pedicels ½ inch long or less, covered with scales; corolla bell-shaped, about ½ inch broad, purple, supported at the base by the small calyx, the petals rounded or ovate; stamens extending ⅛ inch or more beyond the corolla, anthers small, oval; capsule ovoid, oblong, about ¼ inch high.

The distribution of *R. lapponicum* is circumpolar, extending south to New England and New York in the higher mountains. Found in the Canadian Rockies north of Smoky River, and probably farther south.

CHAMAEDÁPHNE

An erect shrub, with stiff, slender, rounded branches, and with narrow, alternate, petioled, evergreen leaves. The white, urn-shaped flowers are borne singly in the axils of the small upper leaves, hanging to one side of the twigs. The calyx is formed of 5 pointed sepals, subtended by two bracts at the base, the lobes longer than the tube. The corolla has 5 recurved lobes, much shorter than the tube. Ten stamens are included within the tube of the corolla, the tapering filaments inserted on its base, and the anthers shorter than the filaments and prolonged into tubes, which open by terminal pores. The ovary is seated on a 10-lobed disk, its cells 5, alternating with 5 grooves, and bearing a slender style and entire stigma. The capsule is shorter than long, opening by clefts from the apex into the cells to release the numerous small seeds.

Only one species is known in this genus, distributed around the world in the Northern Hemisphere. It was first described by Linnaeus in 1753 as *Andromeda,* from material collected in Virgina.

Chamaedaphne calyculàta Don

Dwarf Cassandra. Fig. 60

An unsymmetrical branching shrub, from a few inches to several feet in height, with round, rather crooked stems, in the first season covered with a fine pubescence, and numerous scurfy brown scales, the superficial tissue exfoliating and exposing a smooth, reddish-brown or dark gray bark, the leaf-scars hardly noticeable; leaves ½ to 2 inches long, diminishing upward, elliptic or oblanceolate, varying from acute to rounded at the apex, narrowed to rounded at the base, the margin finely or obscurely serrate, covered on both sides with minute round scales, dark green above, rusty-colored beneath, nearly or quite sessile; flowers in the axils of the upper leaves, drooping on short pedicels, calyx, bracts, and pedicels covered with scales like those on leaves and twigs, bracts and calyx ciliate on the margins; sepals ovate, sharp-pointed, corolla about ¼ inch long, slightly inflated below, the lobes blunt; capsule nearly globose, depressed at the apex, about ⅙ inch thick, accompanied by persistent calyx and style.

In North America this plant is found from Newfoundland to Alaska, and south to Georgia along the Alleghenies, and to Illinois, Michigan, and British Columbia; probably in the Rocky Mountains of Montana and northward.

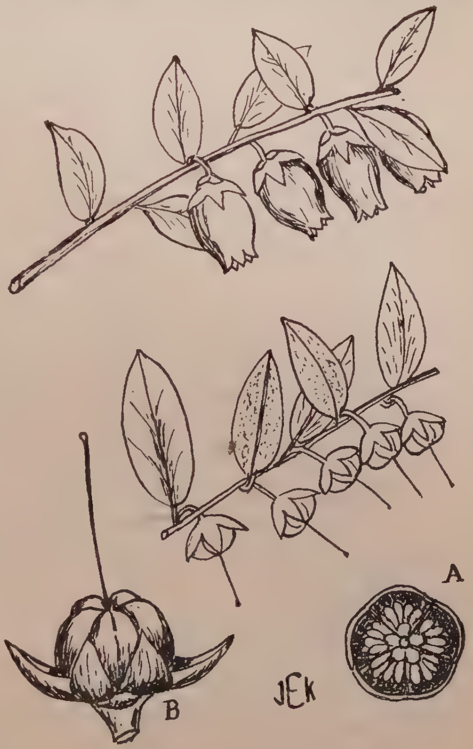

FIG. 60.—*Chamaedaphne calyculata* Don
Dwarf Cassandra

Shoots about twice natural size; *A,* section of fruit, ×5; *B,* fruit, ×5.

KÁLMIA

The kalmias are shrubs or trees, irregularly branched, and with smooth or finely pubescent foliage. The leaves are usually opposite, and as a rule evergreen, the blades leathery and entire.

The inflorescence is an umbel-like cluster, terminal or lateral, the flowers usually numerous, on slender pedicels, subtended by short, thick bracts. The calyx is persistent about the base of the fruit, its lobes 5, narrow and longer than the tube. The corolla is broad, open and shallow, with 10 distinct veins or nerves from the center to the points of the 5 lobes and the sinuses between them. On each vein a pocket holds one of the 10 anthers until the expanding of the corolla releases it, when it springs upward by the elasticity of the straightening filaments, and so scatters the pollen. Five carpels compose the pistil, which has a depressed, 5-celled ovary, slender style, and small stigma. The fruit is a globular capsule, seated in the calyx and opening by 5 valves.

About seven species of *Kalmia* are at present recognized, all exclusively North American in their natural distribution, some of them in the West Indies, others in the northern latitudes and the far Northwest. One species is found in the northern Rocky Mountains.

The flower of *Kalmia* is beautifully symmetrical, and as the genus is exclusively American it is urged for adoption as the national floral emblem. It was named for Peter Kalm, a pupil of Linnaeus.

Kalmia polifòlia Wang

American Laurel. Fig. 61

A shrub, 8 to 20 inches high, often presenting a bifurcated branching habit, owing to the termination of the apical growth by a flower cluster, the young twig smooth, becoming gray with age, with jointed appearance owing to the paired leaf-scars; leaves mostly ½ to 1 inch long, ¼ to ½ inch broad, oblong, elliptical or oval, mostly blunt at the apex, also at the nearly sessile base, flat or with rolled margin, entire, smooth, green above, whitish with a bloom beneath; flowers in a terminal cluster on slender erect pedicels; sepals reddish-green, about ⅛ inch long, ovate, thin and finely frayed at the margin; corolla lilac or deep purple, about ½ inch broad, capsule about ¼ inch broad or more, smooth, globular.

The species as here understood is transcontinental northward, but extends its range southward in the Rocky Mountains to Colorado, on the Atlantic Coast to Pennsylvania, and on the Pacific to California. In British America Drummond reported it as occurring in swamps in the Rocky Mountains, and it is known to grow near Glacier Park, near Lake Louise, and in the Yoho Valley. In Montana it is found usually at altitudes of 6,000 to 9,000 feet, and has been collected near Pony, Granite, Deer Lodge, on the East Boulder Plateau and the Belt Mountains, and near Grinnell Peak in Glacier Park; in Yellowstone Park on Lone Creek.

The original description of *K. polifolia* was written in 1788. The plant was regarded by Gray in 1886 as the same as *K. glauca* Ait., published in 1789, and the variety *microphylla* of Hooker, as merely a small alpine form of the same, a view followed by Nelson (1909), and it will so be considered here. In 1898 Heller gave specific rank to the variety *microphylla,* and in several of the recent publications the form of *Kalmia* found from Alaska to California and Colorado is described as *K. microphylla* (Hook.) Heller.

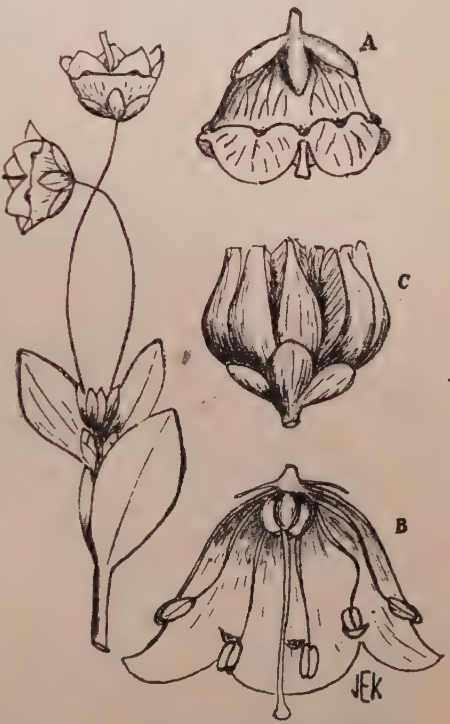

FIG. 61.—*Kalmia polifolia* Wang
American Laurel
Shoot, ×2; *A,* flower, ×4, and *B,* ×6; *C,* fruit, ×5.

LOISELEÙRIA

A low, spreading, evergreen shrub, with opposite or sometimes alternate, leathery leaves, having thick midrib and revolute margin. Flowers are borne in small, terminal clusters, with short, radiating equal pedicels. The calyx is persistent, its 5 narrow lobes much longer than the tube. The corolla, deciduous, is broadly bell-shaped, white to deep pink, the lobes broad, about as long as the tube. The stamens are 5, much shorter than the corolla and contained within its tube, the filaments pointed, smooth, the anthers nearly globular and opening longitudinally. A disk supports the pistil, which has a 2- to 3-celled ovary, a short, thick style and blunt stigma. The fruit is an ovoid capsule, seated in the persistent calyx, opening from the top by 2 to 3 longitudinal clefts, the valves again cleft.

The single species found in this genus is distributed about the Arctic Circle and on the high peaks of northern mountain ranges in both hemispheres. It was first collected in the Alps and described by Linnaeus in 1753 as *Azalea procumbens.*

Loiseleuria procùmbens (L.) Desv.

Alpine Azalea. Fig. 62

A low, depressed shrub with matted, spreading branches, seldom more than 6 to 8 inches high, but extending woody branches 2 to 4 feet along the ground, subdividing into numerous slender branches, marked at frequent intervals by the joint-like elevations of the leaf-scars, which stand opposite in alternating pairs; leaves about ¼ inch long, oval or oblong, blunt at both ends, with a distinct midrib, the margin rolled toward the lower side, the upper surface dark green, smooth, the lower paler; petiole one-fourth the length of the blade or less; flowers 1 to 5 from terminal buds, the pedicels slender, about ¼ inch long, the flowers about ⅛ inch long, bell-shaped; calyx of 5 oblong, almost separate sepals, about half as long as the corolla; corolla white, petals ovate, capsule ovoid, pointed, about ⅛ inch long.

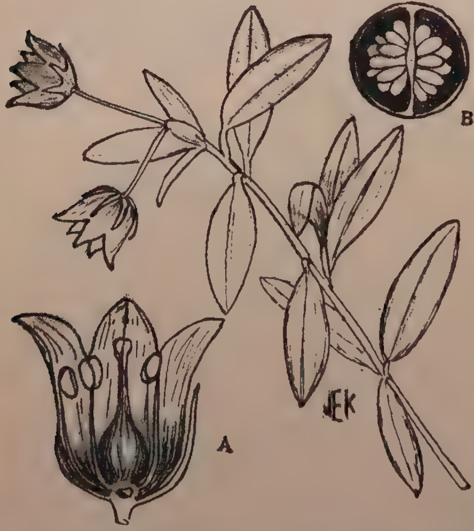

Fig. 62.—*Loiseleuria procumbens* (L.) Desv.
Alpine Azalea

Shoot, ×3; *A,* flower, ×9; *B,* section of ovary, ×18.

Since this plant is circumpolar in its distribution, it probably occurs in the high altitudes of the northern Rockies. It is also described under the names *Azalea procumbens* L. and *Chamaecistus procumbens* Kuntze.

CASSÌOPE

The species of *Cassiope* are low, tufted, evergreen shrubs of heath-like habit, the branches creeping, prostrate or ascending, and more or less matted. The leaves are small, entire, thick, in 4 ranks along the slender stem, so closely placed and overlapping as to conceal the twigs. Small flowers are borne near the ends of the branches, as a rule singly, nodding at the tops of slender pedicels, perfect and bell-shaped. The calyx is persistent, its lobes 4 to 5, usually rounded, the tube very short. The corolla is white or pink, bell-shaped, with 4 to 5 round lobes, which are shorter than the tube. The stamens, 8 to 10, are included within the corolla tube, the filaments short, tapering, the anthers globular or oval, bearing 2 slender appendages. The ovary is 5-celled, round, or somewhat flattened from above, the style short and often persistent; capped by a minute stigma. The fruit is a 5-celled, round or oval capsule, which opens from above into each cell, and is subtended by the persistent calyx.

About ten species of *Cassiope* are reported from the colder regions of the Northern Hemisphere, their range extending south along high mountain crests in Europe, Asia, and North America.

This genus, which was formerly included under *Andromeda,* was established by David Don in 1834, the first specimen described being *Cassiope tetragona,* from Lapland.

Key to the Species of Cassiope

Leaves distinctly 4-ranked
    Leaves not grooved beneath.............................. 1. *C. Mertensiana*
    Leaves grooved beneath.................................. 2. *C. tetragona*
Leaves not distinctly 4-ranked.............................. 3. *C. hypnoides*

1. **Cassiope Mertensiàna** (Bong.) Don

Fig. 63

A low shrub, usually less than a foot in height, with ascending branches, which in the older parts finally become smooth by the shedding of the long-persistent foliage, the young twigs entirely covered by the close investment of small, fleshy, scale-like leaves arranged in 4 ranks; leaves about ⅛ inch long, lanceolate, pointed, incurved at the apex, smooth and sessile; flowers few, near the ends of the branches, nodding on slender pedicels, usually less than 1 inch long;

sepals lanceolate; corolla bell-shaped, about ¼ inch long, two to three times as long as the sepals, pink, lobes blunt; capsule oval, about ⅛ inch long.

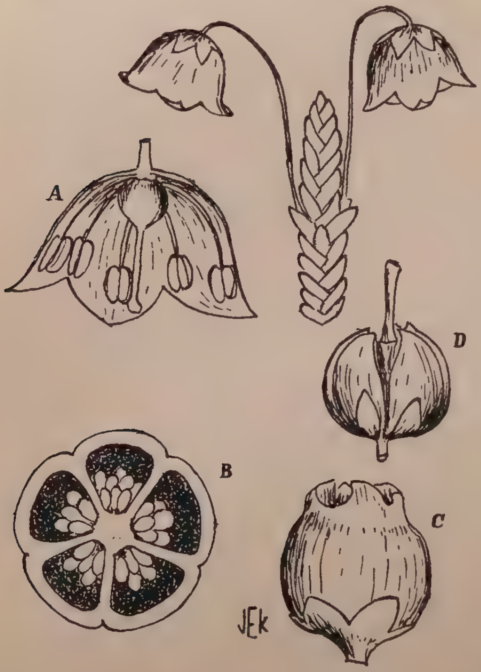

Fig. 63.—*Cassiope Mertensiana* (Bong.) Don Shoot, ×2; *A,* flower, ×4; *B,* section through ovary, ×8; *C* and *D,* fruit, ×5.

The distribution of this species as at present known is confined mainly to the Pacific Coast from Alaska to Montana, Nevada, and California. In Montana the following localities may be mentioned: Beaverhead and Madison counties, Belt Mountains, and Gallatin Peak; in the Canadian Rockies, at Lake Louise, Kicking Horse Pass, and the mountains north of Smoky River to latitude 56° N.

2. Cassiope tetrágona
Don

A low shrub, from 2 or 3 inches to a foot in height, with stout branches, the twigs ascending, closely covered with a thatch of small, scale-like leaves; leaves 4-ranked, ⅛ inch or more long, sessile, boat-shaped, grooved on the back, blunt at the apex, minutely pubescent, at least when young; flowers few, near the ends of the branches, nodding on the slender pedicels ½ inch or more long; sepals lanceolate or ovate, less than half as long as the corolla; corolla bell-shaped, less than ¼ inch long, lobes rounded; capsule globoid or ovoid, about ⅛ inch long.

The range of *C. tetragona* is throughout the Arctic regions around the world, in North America reaching south to Labrador, Hudson Bay, Alaska, and British Columbia. Its distribution in the Rocky Mountains is not fully known.

A form of *Cassiope* from near Banff has been described by Small under the name, *C. saximontana.* It is said to differ from *C. tetragona* in having more slender branches.

3. **Cassiope hypnoides** (L.) Don

A low, densely tufted, scarcely woody plant, 2 to 3 inches high, with the aspect of a moss, branching freely, the surface of the twigs in most places concealed by the dense thatch of small leaves; leaves about 1/10 inch long, linear, sharp-pointed at the apex, the base broad, sessile, somewhat spreading, convex beneath, smooth; flowers about 1/4 inch wide, broadly bell-shaped; sepals ovate, with thin margins; corolla deeply cleft, nearly white, the petals oval; capsule globose, about 1/10 inch in diameter.

This plant is found in the Arctic regions of Europe, Asia, and North America, reaching south to Maine and New York, and probably in the Rockies to Alberta or Montana.

GAULTHÈRIA

The gaultherias are tall or low shrubs of various habit, erect, or creeping by means of horizontal rootstocks. The leaves are evergreen, usually alternate, sometimes more or less toothed. The flowers are urn-shaped, white, red, or pink, and are borne in the axils of the upper leaves or in clusters. The calyx is small in flower, sometimes increasing with the ripening of the fruit, and consists of 5 united sepals, the lobes longer than the tube. The corolla is urn-shaped or conical, with a narrow mouth and 5 spreading or recurved lobes. The stamens are 10, entirely included within the tube of the corolla and attached to its base, the anthers appendaged and opening by terminal pores. The ovary, surrounded by a 10-lobed disk, is divided into 5 cells, with numerous ovules in each cavity, and bears a columnar style and entire stigma. The fruit is berry-like, the ovary enclosed in the receptacle and enlarged calyx, which is often colored and fragrant.

About one hundred species are known in the genus *Gaultheria,* mostly belonging to the Andes of South America, about twenty-four in North America, and some in Asia. Only two species, however, seem to occur in the Rocky Mountains.

To this genus belong the wintergreen (*G. procumbens*) of the Eastern states, and the well-known salal (*G. Shallon*) of the Pacific Coast, the berries of which are edible. Some exotic species are grown as ornamentals.

Key to the Species of Gaultheria

Corolla little longer than the calyx.......................... 1. *G. humifusa*
Corolla about twice as long as the calyx..................... 2. *G. ovatifolia*

1. **Gaultheria humifùsa** (Graham) Rydb.

Creeping Wintergreen. Fig. 64

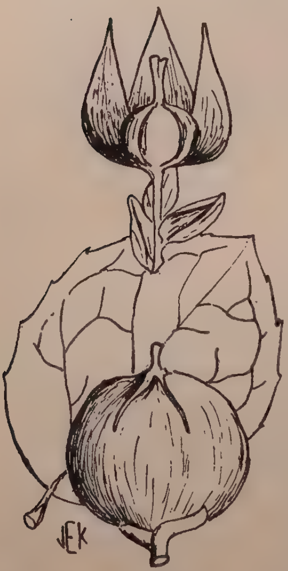

Fig. 64. — *Gaultheria humifusa* (Graham) Rydb. Creeping Wintergreen

A trailing, vine-like shrub, usually less than 4 inches high, smooth or nearly so; leaves ½ to ¾ inch long, oval or nearly round, blunt-pointed at the apex, rounded at the base, entire or obscurely toothed, smooth on both sides; petioles very short; calyx ½ to ⅓ inch broad, the lobes ovate, pointed, smooth; corolla about ⅙ inch long, bell-shaped, little exceeding the calyx, the lobes ovate, nearly as long as the tube; stamens shorter than the corolla; fruit about ¼ inch in diameter, scarlet.

This plant is found from Wyoming and Colorado to Alberta and British Columbia, growing usually on shady, wooded hillsides at elevations of several thousand feet. In Yellowstone Park it is found on East De Lacy Creek and on Broad Creek; in the Canadian Rockies and Selkirks, common generally in meadows; found at Lake Agnes and Pipestone Creek. It was first collected by Douglas in this region, and grown from seed in Edinburgh, where it was described by Graham in 1831 as *Vaccinium humifusum.*

2. **Gaultheria ovatifòlia** Gray

A depressed, trailing shrub, the branches rising to a height of 12 inches or less, with slender twigs, somewhat pubescent with rusty hairs; leaves ¾ to 1¼ inches long, ovate or nearly round, acute or short taper-pointed at the apex, mostly rounded at the base, serrate with small teeth, dark green and shining above, paler beneath, smooth on both sides; calyx ¼ inch or more broad, hairy, its lobes ovate, sharp-pointed; corolla bell-shaped, less than ¼ inch long, twice the length of the calyx lobes, the lobes of the corolla ovate; nearly as long as the tube; stamens shorter than the corolla; fruit ½ to ⅓ inch in diameter, scarlet.

This species is distributed through British Columbia, Washington, and Oregon, and as far east as Idaho, according to present knowledge, and is likely to be found in the humid forests of western Montana. It is found in the Canadian Rockies on Avalanche Mountain near Glacier.

It was first described by Gray in 1883.

ARCTOSTÁPHYLOS

This genus comprises a variety of woody plants, from low, creeping shrubs (those within our range) to small trees. The leaves are alternate, petioled, entire, evergreen or deciduous. The flowers are white or pink, in small terminal clusters or in the axils of the upper leaves, nodding. The calyx, 4- to 5-parted, with broad lobes, is persistent. The corolla is urn-shaped or oblong bell-shaped, with 5 round, short, recurved lobes. Ten stamens are included within the tube of the corolla, the filaments thick and usually hairy at the base, the anthers with 2 recurved appendages and opening by round terminal pores. The ovary surrounded by a 10-lobed disk is 4- to 10-celled, the ovules solitary in the cavities, the style slender. The fruit is berry-like, the several carpels weakly coherent or separate within the fleshy tissue formed of their confluent outer walls.

Twenty or more species are known in this genus, including a group by some authors set off under the name *Arctous*. They belong mainly to the New World and occur chiefly on the Pacific Slope. Two or three species are found in the northern Rocky Mountains.

From the genus *Arctostaphylos* some authors have differentiated a few forms under the generic name *Arctous* or *Mairania,* based chiefly on the contention that the nutlets are coherent in the former and not so in the latter. To this, however, Fernald takes exception (*Rhodora,* 1914), contending that the distinction is ill-founded, a conclusion which seems to be supported by our own observations. The species of our flora in this group will therefore be treated as *Arctostaphylos.*

KEY TO THE SPECIES OF ARCTOSTAPHYLOS

Leaves leathery, entire.................................... 1. *A. Uva-ursi*
Leaves thin, serrate....................................... 2. *A. alpina*

1. **Arctostaphylos Uva-ursi** (L.) Spreng.

Kinnikinnick. FIG. 65

Low, creeping, evergreen shrub, the horizontal stems sometimes 3 to 5 feet long, with numerous ascending branches 5 to 8 inches high, the bark on older branches exfoliating in thin brown layers, the young twigs gray or brown or reddish, finely pubescent; leaves commonly an inch or less in length, spatulate in form, rounded at the apex, narrowed to a short petiole at the base, the margin entire, both surfaces smooth but veiny; flowers in small terminal clusters, bracted, calyx green, corolla white, both tinged with pink; sepals ovate, surrounding the base of the corolla; corolla ovate, with 5 minute, blunt, recurved lobes surrounding the narrow mouth; fruit smooth, red, globose, ¼ to ⅓ inch in diameter, the pulp mealy, slightly sweet, the 5 nutlets sometimes weakly coherent into a single stone.

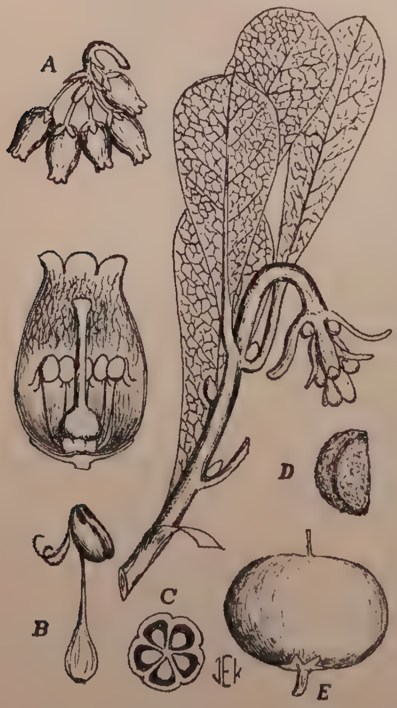

FIG. 65.—*Arctostaphylos Uva-ursi* (L.) Spreng. Kinnikinnick

Shoot, ×2; *A*, flower cluster, ×1⅓; *B*, stamen, ×10; section of flower, ×5; *C*, section of ovary, ×10; *D*, nutlet, ×3; *E*, fruit, ×2.

This species has a very wide geographic distribution, being circumpolar and extending south over much of the temperate zone. In the Rocky Mountains it is found as far south as New Mexico. Throughout the northern mountains it is very common on open wooded slopes at all elevations up to 4,000 and 5,000 feet, reaching even to 7,500. The following localities may be mentioned: In the Canadian Rocky Mountains, at Banff, Field, and Emerald Lake;

in Montana, at Missoula, Helena, Bridger Canyon, and in Gallatin County.

2. **Arctostaphylos alpina** Spreng.

Alpine Bearberry

A prostrate creeping shrub, the leafy branches tufted, rising to a height of only 2 to 5 inches, the twigs smooth or nearly so; leaves ½ to 1 inch long, ¼ to ½ inch wide, oblanceolate or obovate, acute at the apex, narrowed to the base, margin serrate, both surfaces smooth, usually rough-veiny, the upper surface dark, the lower light green; petioles slender, ¼ to ½ inch long; flowers few, in small terminal, bracted clusters; sepals triangular, acute; corolla white, ovoid, nearly ¼ inch long, the lobes ciliate; fruit ¼ to ⅓ inch in diameter, purple-black, the nutlets not as a rule coherent.

This species also is circumpolar. In North America it spreads southward to New England, Quebec, British Columbia, and on the heights of the Rocky Mountains probably to Montana. It is found at a number of stations in the Canadian Mountains: along the Mackenzie River, in Kicking Horse and Bow River passes, and at Banff, at Mount Sulphur, and in Yoho Valley.

Two forms, very similar to the foregoing, *Arctostaphylos rubra* Fern. and *Arctous erythrocarpa* Small have been described from plants collected in the Canadian Rockies, and differ from *A. alpina* principally in having red instead of purple-black fruit, and somewhat larger leaves.

VACCINIÀCEAE

Huckleberry Family

The plants of this family are shrubs or small trees, those of the Rocky Mountains all shrubs, with alternate simple leaves and small flowers, solitary or in clusters, the pedicels usually bearing one or more small reduced leaves, or bracts; the flower is perfect and differs from the heaths in having the ovary inferior. Thus the calyx, corolla, and stamens appear inserted on the summit of the ovary. The calyx and corolla are each 4- to 5-lobed or cleft, or the latter in a few cases divided into separate petals. The corolla is of various shapes, globose or tubular, urn-shaped, or bell-shaped, and after fertilization is deciduous. The stamens are twice as many as the lobes of the corolla, inserted on the tissue at the base of the corolla, the filaments usually short and flattened, the anthers opening by two pores at the top, and often bearing tail-like appendages on the back, developed from the connective. The ovary is divided into 2 to 10 cells, usually 5, and is covered above by a glandular disk, which surrounds the straight, slender style; the stigma is simple or marked by 4 to 5 minute lobes. Each cell of the ovary contains numerous ovules, which are attached to the placenta in the angle of each cell toward the axis of the flower. The fruit is a berry or a berry-like development of the ovary, containing several small seeds or nutlets. The seeds are somewhat flattened, the coat bony, and each occupied by a central embryo surrounded by a fleshy endosperm.

About twenty genera are known to this family, and over three hundred species, with a wide geographic range. While chiefly belonging to the North Temperate latitudes around the world, they are numerous in South America, some are found in India and others on the high tropical mountains of Asia, Africa, and Madagascar, also in Hawaii, Japan, Borneo, and other islands of the Pacific. The American members of the group are included under five to six genera, and, though the species are not numerous, most of them are widely distributed and some are very common in the Rocky Mountains.

While the Huckleberry Family is separated from the heaths mainly on the basis of the inferior ovary, in other features of the floral structure they are very similar, and by some authors are even yet retained within that family. The Huckleberry Family furnishes fruits of large commercial importance, both wild and cultivated.

KEY TO THE GENERA

Low trailing plant with white fruit....................... *Chiogenes*
Erect or trailing plants with red, purple, or black fruit...... *Vaccinium*

CHIÓGENES

Low, creeping, evergreen shrubs with small, simple, alternate leaves, arranged apparently in two ranks along the slender stems. The small white flowers are solitary in the axils of the leaves, on short, recurved pedicels. The ovary in this case is not wholly inferior, thus forming a connecting link with the heaths, and bears two bracts at its base. The calyx and corolla each are 4-lobed, the stamens 8, shorter than the tube, and the pistil composed of 4 carpels. The flower is thus on the plan of 4 throughout. The anthers are borne on short, thick filaments, each sac opening by a slit from the apex to the middle, and prolonged from the apex into two teeth; they are not, however, produced into tubes with terminal pores or appendaged from the connective as in many other members of this and the preceding family. Covering the ovary is an 8-lobed disk, surrounding the short style. The fruit is a globose or oval berry, snow-white, many-seeded, and mealy.

The genus as at present known includes but a single species, belonging to North America and Japan, though some are inclined to give specific distinction to the American and Asiatic forms.

Chiogenes hispídula (L.) Torr. & Gray

Moxie Plum. Fig. 66

Branches reaching a foot or more in length, very slender, sparsely covered with stiff, appressed, reddish hairs, diverging at rather wide angles; leaves persistent, leathery, ¼ to ⅓ inch long, broadly oval, bluntly pointed or sometimes acute at the apex, mostly rounded at the base, dark green, smooth above, paler beneath and bearing a few scattered, appressed, reddish hairs, which also appear on the margins; flowers few, solitary in the axils of the leaves, the pedicel and its flower hardly exceeding the leaves, nodding; fruit an aromatic berry, usually covered with minute bristles and crowned by 4 calyx teeth, and becoming snow-white.

The distribution of this plant is from Newfoundland to British Columbia and south to North Carolina, Michigan, Idaho, and probably Montana; in the Canadian Rockies it is found at Emerald Lake.

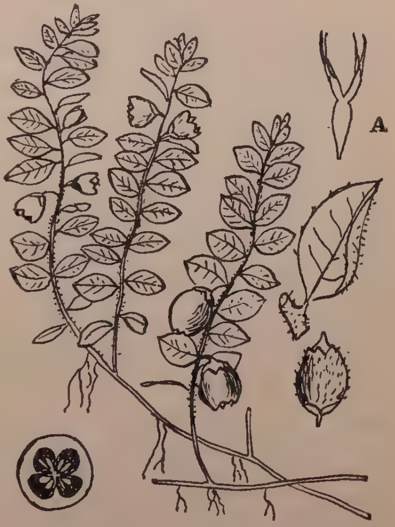

Fig. 66.—*Chiogenes hispidula* (L.) Torrey & Gray. Moxie Plum
Shoot about two-thirds natural size; *A*, anther. After Britton and Brown.

VACCÍNIUM

The species of *Vaccinium* in our range are branching, sometimes trailing, shrubs, with alternate, usually deciduous leaves, and small white or red flowers, either in clusters or solitary in the axils of the leaves. The ovary is globose or hemispheric, surmounted by the sepals and other parts of the flower. The margin of the calyx tube above the ovary is divided into 4 to 5 lobes and is persistent. The corolla is urn-shaped, bell-shaped, or cylindrical, its margin divided into 4 to 5 teeth or lobes. The stamens are 8 to 10, with anthers prolonged upward into tubes, which open by terminal pores, sometimes, but not always, appendaged. The ovary, consisting of 4 to 5 carpels, normally contains as many cells, but sometimes may be divided by false partitions into twice as many cells. The style is straight and the stigma minute. The fruit is a many-seeded berry.

About one hundred and thirty species of *Vaccinium* are known, their wide geographic range extending from the Arctic Circle to the high mountains of the tropics. They are most common in North America and the Himalayas, and are practically confined to the Northern Hemisphere. Several species are common in the northern Rockies at elevations usually above 4,000 feet in the latitudes of Montana.

The genus was formerly much more inclusive than at present, and even now conservative botanists would retain species which others have proposed to segregate into generic groups under the names, *Oxycoccus, Vitis-Idaea, Cyanococcus,* etc. The well-known huckleberries and cranberries are in this family, and constitute its claim to economic importance. Thousands of acres of cranberries are cultivated in the United States, and the huckleberry is now yielding to horticultural treatment. In the wild the fruits of *Vaccinium* have formed no unimportant article of diet for animals and for all classes of people.

Key to the Species of Vaccinium

Erect shrubs with deciduous leaves	
Branches not angled	
Leaves entire	
Leaves veiny	1. *V. uliginosum*
Leaves not strongly veined	2. *V. occidentale*
Leaves finely serrate	3. *V. caespitosum*

Branches angled
Fruit blue, black, or purple
Leaves nearly entire; fruit blue with a bloom 4. *V. ovalifolium*
Leaves serrate; fruit black without a bloom.
Plant usually over 2 feet in height....... 5. *V. membranaceum*
Plant usually less than 1 foot high....... 6. *V. oreophilum*
Fruit bright red
Leaves serrate, green on both sides......... 7. *V. scoparium*
Leaves entire, pale beneath.................. 8. *V. parvifolium*
Trailing evergreen shrubs
Leaves obovate, rounded at the apex.............. 9. *V. Vitis-Idaea*
Leaves ovate, acute at the apex.................... 10. *V. Oxycoccus*

1. **Vaccinium uliginòsum** L.

Bog Huckleberry

A low shrub, under 2 feet in height, with stiff stems and branches, the twigs round, not angled, smooth, changing from green to chestnut, brown, or gray, often densely bunched; leaf-scars semicircular; winter buds minute, ovate, with 4 to 5 exposed smooth scales; leaves thick, seldom 1 inch long, more often ½ inch, ovate or obovate, mostly blunt-pointed or rounded at the apex, narrowed or wedge-shaped at the base, entire, netted-veined, smooth on both sides, or with a very fine pubescence beneath, almost sessile; flowers about ¼ inch long, few or solitary, near the ends of the branches, drooping on short pedicels; calyx usually 4-lobed, the sepals broad; corolla pink, ovoid or urn-shaped, 4- to 5-lobed; stamens twice as many as the lobes of the corolla; berry blue, with a bloom, about ¼ inch in diameter.

This species is circumpolar in its distribution. In North America its range extends from Greenland to Alaska, and south to New England, the Adirondacks, Lake Superior, and British Columbia, and north to the Arctic Sea. It occurs in cold bogs and on high mountains in the southern parts of its range. Information is yet meager as to the extent of its range in the Rocky Mountains, but it should be found in some of the high altitudes of Alberta and Montana.

It was described by Linnaeus in 1753.

2. **Vaccinium occidentàle** Gray

Western Huckleberry

A shrub, 1 to 3 feet high, with round, smooth, stout stems, the branches diverging at narrow angles, the youngest twigs green, smooth, not angled; leaf-scars semicircular; winter buds minute, ovate, smooth, with 3 to 4 exposed scales; leaves thin, ½ to ¾ inch long, obovate to oblanceolate, varying from acute to rounded at the apex, narrowed to a wedge-shaped base, margin entire, both surfaces usually smooth; petiole very short; flowers about ¼ inch long, mostly solitary, oblong to obovate; sepals 4 to 5, broad; lobes of the corolla, 4 to 5, rounded; berry blue, with a bloom, less than ¼ inch in diameter.

This plant has a northwestern range from British Columbia to California, and east to Montana and Utah. It is found in Yellowstone Park near Lone Star Geyser and Gibbon River.

3. **Vaccinium caespitòsum** Michx.

Dwarf Huckleberry

This is a very low shrub, 3 to 7 inches high, the branches forming rather dense tufts, the youngest twigs nearly or quite smooth, not angled, becoming darker with age; leaf-scars usually quite prominent, semicircular; winter buds minute, ovate, strongly flattened dorsally, blunt-pointed, with 1 to 2 exposed scales; leaves commonly less than 1 inch long, obovate to oblong, wedge-shaped, varying from acute to obtuse at the apex, narrowed to the base, the margin finely serrate, the surface green and shining on both sides, the netted venation distinct; petiole very short; flowers mostly solitary in the axils, drooping, longer than their pedicels, about ⅕ inch long; calyx indistinctly 4- to 5-lobed; corolla pink or white, obovoid to oblong, usually 5-toothed; stamens usually 10; berry blue, with bloom, about ¼ inch in diameter.

The distribution of *V. caespitosum* is transcontinental, and extends southward to New England, Colorado, and Oregon. On the eastern coast it reaches north to Labrador, on the western to Alaska. In the Canadian Rockies it is found at Banff, Field, and Emerald Lake; in Montana, at Granite and the head of Prickly Pear Canyon.

4. **Vaccinium ovalifòlium** Smith

Oval-leaved Huckleberry

A straggling, branched shrub, 3 to 12 feet in height, with smooth, jointed, sharply angled twigs, the bark on older stems shreddy; leaf-scars more crescentic than semicircular; winter buds 1/16 to ⅛ inch in length, ovate, round-pointed, flattened dorsally, covered by two valvate scales; leaves thin, 1 to 2 inches long, broadly oval, rounded at both ends, usually with a tiny apiculation at the apex, entire or very nearly so, smooth and green on both sides, but somewhat paler beneath; petioles short but distinct; flowers solitary in the axils, on short, recurved pedicels; calyx almost entire, its shallow lobes very broad and rounded; corolla broadly ovoid, about ¼ inch long; stamens 10; berry blue with a bloom, ¼ to ⅓ inch in diameter.

This species is not only transcontinental from Quebec to Alaska, but is said also to occur in Japan. It ranges south to Michigan and Oregon, and in the Rocky Mountains to Montana. In Montana it is reported from Spanish Basin; in British America, from Glacier, Banff, Yoho Valley, and other places.

5. **Vaccinium membranàceum** Dougl.

Thin-leaved Huckleberry. FIG. 67

A widely branched shrub, 1 to 5 feet tall, nearly smooth throughout, the young twigs usually angled, slender, leaf-scars nearly semicircular; winter buds nearly ⅛ inch long, somewhat flattened dorsally, ovate, sharp-pointed, smooth, with 2 valvate scales; leaves thin, 1 to 2 inches long, ½ to 1 inch wide, oval, oblong or ovate, acute or blunt at the apex, rounded or wedge-shaped at the base, the margin finely serrate with small, blunt teeth, green on both sides, but not shining; flowers mostly solitary in the axils of the leaves, pendant on slender pedicels, which become erect in fruit; calyx saucer-shaped, about the base of the corolla, its margin entire, or but slightly divided into lobes; corolla nearly globular, about ⅛ inch in diameter, yellowish-green or purplish, mostly 5-toothed; stamens usually 10; berry dark purple, ½ to ⅓ inch in diameter, acid.

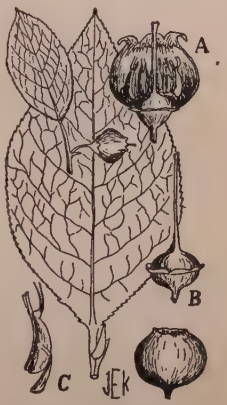

FIG. 67.—*Vaccinium membranaceum* Dougl. Thin-leaved Huckleberry

Leaves about natural size; *A,* flower, ×2½; *B,* pistil, ×3½; *C,* stamen, ×5; fruit about natural size.

This species is found from Alaska to California and east to Lake Superior. It appears also in eastern Washington, Idaho, Montana, and Wyoming, and in the Rocky Mountains of Canada. The following localities may be noted: in Idaho, Tamarack, Lake Waha, and the summits of the Coeur d'Alene Mountains; in Montana, in Glacier Park between Swiftcurrent and Ahern passes at an altitude of 6,200 feet, near Missoula, Clinton, Granite, Bozeman, in the Bitterroot Mountains near Lolo Peak, in Spanish Basin, and along the Jocko River; in British America, on Peace River and in North and South Kootenai passes, and on the Flathead River.

This plant is generally regarded as the same as *V. myrtilloides* described by Hooker. *V. globulare* Rydb., apparently a very similar form, was described in 1900 as distinct on the basis of certain not very marked differences in the form of the corolla and other parts, but the species has not been wholly accepted by subsequent writers.

6. **Vaccinium oreophìlum** Rydb.

Low Blue Huckleberry

A low shrub, less than 1 foot high, with branches more or less thickly bunched in broom-like fashion, slender, angled twigs, smooth usually throughout; leaf-scars small, transversely oval or reniform; winter buds flattened, ovate, less than ⅛ inch long, acute, covered by 2 valvate scales; leaves less than ⅛ inch long, ovate or oval, mostly acute at the apex and narrowed or rounded at the base, finely serrate on the margins, with a conspicuous midrib and netted small veins; almost sessile; flowers solitary in the axils of leaves, often numerous, on short, recurved pedicels; calyx margin narrow, entire; corolla globular or broadly ovoid; berry black, about ¼ inch in diameter.

The distribution of *V. oreophilum* as described by Rydberg extends from British Columbia to Alaska and south to California and New Mexico. In Idaho it was collected by Leiberg on the tops of the Coeur d'Alene Mountains, and noted by others at Glacier in the Canadian Rockies. It occurs usually at high altitudes, especially in the southern part of its range.

This plant is known to most authors as *V. Myrtillus* L., which is found also in Europe and Asia. Exceptions to this view, however, were taken by Rydberg, who considers the American plant distinct from the European, particularly in the form of the corolla, which in the former is said to be globose, in the latter ovoid. Hooker described a form of *V. Myrtillus* under the varietal name *microphyllum*.

7. **Vaccinium scopàrium** Leiberg

Low Red Huckleberry

A low shrub, 6 to 8 inches high, the smooth, slender, angled twigs often in broom-like bunches; leaf-scars small, transversely oval or reniform; winter buds ovate, flat, acute, with two valvate scales; leaves ½ inch or less long, ovate or oval, sharply or bluntly pointed at both ends, minutely serrate, smooth on both sides, but with more or less evident netted veins, nearly sessile; flowers solitary in the axils of the leaves, very small; calyx almost entire; corolla ovoid or urn-shaped; berry bright red, less than ¼ inch in diameter.

The distribution of this plant extends from British Columbia to Alberta and south to California and Colorado. In Yellowstone Park it occurs at Upper Falls and Electric Peak; in Montana, in Park County, Spanish Basin, Granite, on the summit of the Continental Divide, near the road crossing from the Bighole to the Bitterroot Valley, and in the Swan Mountains east of Bigfork; in the British possessions, at Lake Louise, Moraine Lake, Laughing Falls in Yoho Valley, and other places.

8. **Vaccinium parvifòlium** Smith

Tall Red Huckleberry

A tall shrub, 3 to 12 feet in height, of irregular form, young branches and twigs green, sharply angled, smooth; leaf-scars crescentic; winter buds less than ⅛ inch long, sharply pointed, flattened, covered by two valvate scales; leaves usually less than 1 inch long, oval, round or blunt at the apex and base, entire, green above, paler beneath, nearly sessile; flowers solitary in the axils of the leaves; calyx small, with 5 rounded sepals; corolla globular, petals 5; berry red, juicy, sharply acid, ¼ to ⅓ inch in diameter.

The range of this species is mainly along the Pacific Coast from Alaska to California, but it extends to the east at least as far as Idaho and probably western Montana. In the Coast Mountains of Oregon it is plentiful in open woods, where it reaches its best development. If found in the Rocky Mountains it is likely to be much smaller.

9. **Vaccinium Vitis-Idaèa** L.

Mountain Cranberry

A low, evergreen shrub, 3 to 8 inches high, with erect, slender twigs, which are round and nearly or quite smooth as to hairs, but rough on account of the elevated leaf-scars; leaves persistent, mostly less than ½ inch long, oval or obovate, rounded and often slightly notched at the apex, bluntly or sharply angled at the nearly sessile base, the margin slightly rolled and serrulate, the upper surface green and somewhat shining, the lower paler and black-dotted, almost hairless; flowers in short, 1-sided clusters at the ends of the branches, nodding on short pedicels, and subtended by reddish bracts; calyx small, 4-toothed; corolla white or pink, bell-shaped, 4-lobed; stamens 8; berry dark red, acid, less than ¼ inch thick.

The range of this species is circumpolar, and in North America extends from Greenland to Alaska and south to New England, the Great Lakes, Alberta, and British Columbia. Northward it reaches the islands of the Arctic Sea. In the British Rockies it is found near Banff and Lake Louise.

Macoun states that it produces fruit in enormous quantities and is valuable as a spring food for birds on their return from the south. It is also used by people dwelling in or traveling through the northland, as one of the most dependable and valuable sources of food.

10. **Vaccinium Oxycòccus** L.

Cranberry

A low, spreading, evergreen shrub, with vine-like branches 6 to 18 inches long, rooting at the nodes, rising from 1 to 6 inches; leaves ¼ to ⅓ inch long, ovate, sharp-pointed at the apex, cordate and rounded and nearly sessile at the base, the margin slightly rolled, entire, the surface smooth and dark green above, white or very pale beneath; flowers pink, few, from a terminal scaly bud, on slender, nodding pedicels about an inch long, and usually with a minute bract or two near the base; calyx small; corolla about ⅓ inch broad, divided nearly to the base; stamens 8 to 10, the filaments minutely pubescent, and broad, about half the length of the linear, tubular anthers; berry globose, acid, ¼ to nearly ½ inch thick.

The distribution of *V. Oxycoccus* is circumpolar, in North America ranging from the far north to the mountains of Pennsylvania, to Michigan and Washington; in the Rocky Mountains to the southern part of the British possessions, where it is reported from Lake Louise, and probably to Montana and Idaho.

While this plant was first described by Linnaeus in 1753 as *V. Oxycoccus,* it has also been described and listed under other names (*Schollera Oxycoccus* Roth., 1788, and *Oxycoccus palustris* Brown, in 1805). It is now known in some of the manuals as *Oxycoccus Oxycoccus,* a name given by MacMillan in 1892. A form of the cranberry which Gray considered a variety, *intermedium,* of this species was recognized by Rydberg as a species, *O. intermedius,* but seems to differ very little from *V. Oxycoccus.* Its distribution is said to be from Alaska to Washington and Idaho, and to eastern Asia.

POLEMONIÀCEAE

PHLOX FAMILY

The plants of this family are mostly herbs, but a few are more or less woody. The leaves are opposite or alternate, entire, lobed or dissected. The flowers are perfect, usually regular, and borne in clusters of various shapes and sizes. The flower consists of four series of members, calyx, corolla, stamens, and pistil, in each of which, except the last, 5 members are represented. The calyx is tubular or bell-shaped, 5-toothed, the teeth more or less overlapping in the bud, and the corolla funnelform, saucer-shaped, or bell-shaped, its rim bearing 5 lobes alternate with the calyx teeth. The 5 stamens are inserted on the tube of the corolla, alternate with its lobes. The pistil is composed of 3 to 5 carpels united to form a 3- to 5-celled ovary, slender style and 3- to 5-branched stigma, the ovules from 1 to many attached to an axial placenta. The fruit is a thin-walled or half-woody capsule of 3 to 5 valves, spreading at the apex when mature to discharge the small and compressed or angular seeds. The embryo, straight or nearly so, lies in the axis of a fleshy endosperm.

There are about ten genera in the Phlox Family and something over two hundred species. They are most abundant in western North America, but extend to South America in Chile and Peru, and to the temperate regions of Europe and Asia. Although the majority are natives of the North Temperate Zone, some are tropical and a few are arctic-alpine in their distribution.

The members of this group are mostly herbs, but a few are woody or half-woody, especially in southern latitudes. One shrubby *Gilia,* and a few species of *Phlox* with a partially woody base enter the northern Rockies, hardly reaching, however, beyond the southern part of Montana.

From the utilitarian standpoint the Phlox Family is of little importance, but the phloxes, gilias, and cobaeas are among the most attractive of ornamental plants, and are familiar in gardens the world around.

GÌLIA

The members of this genus are mostly herbs with opposite or alternate leaves of various forms and small or large flowers in open or compact clusters or solitary. The calyx is 5-cleft, tubular, funnelform or bell-shaped, the teeth sharp-pointed. The corolla often has a slender tube with broad spreading margin, divided into 5 rounded lobes. The stamens are either shorter or longer than the tube of the corolla. The ovary is oblong or ovoid, 3-celled, the ovules solitary or several in each cavity, and the capsule developed from it is of similar form, 3-celled, at length rupturing the calyx. The seed coats are usually mucilaginous when wetter, and in some species emit spiral, thread-like tubes.

About one hundred species of *Gilia* are known, natives mostly of North America, abundant in the Rocky Mountains. Though mostly herbs, the following species may be included in this treatment.

Gilia púngens (Torr.) Benth.

Sharp-leaved Gilia

Fig. 68

A shrubby rigid plant, usually less than a foot in height, with spreading crooked branches and somewhat viscid; leaves alternate, or the lower opposite, often with smaller ones fascicled in their axils, ¼ to ½ inch long, divided into 3 to 7 sharp, stiff, awl-shaped segments, minutely pubescent or smooth; flowers solitary or 2 to 3 together, sessile at the ends of the branches, ¾ to 1 inch long; calyx lobes sharp, nearly or quite as long as the tube; corolla pink or white, funnelform, the tube longer than the calyx, the lobes broad, rounded; ovules 8 to 10 in each cell; seeds not mucilaginous when wetted.

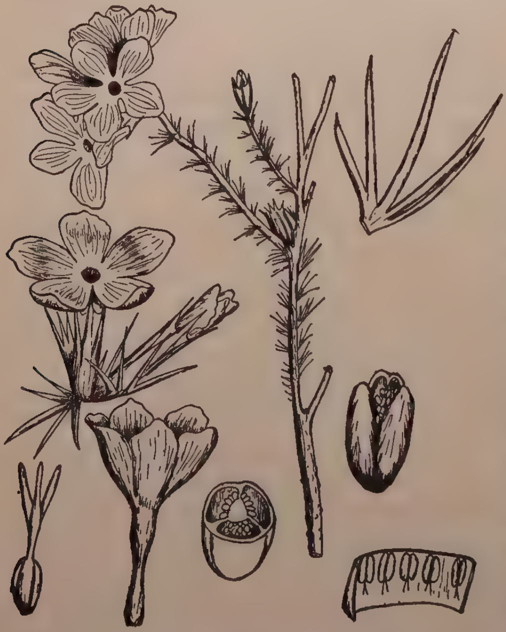

Fig. 68.—*Gilia pungens* (Torr.) Benth. Sharp-leaved Gilia

After Hooker and Arnott.

This plant is found from Montana to Colorado, and from British Columbia to California. It has been collected in Montana in Beaverhead County and at Cliff Lake; in Yellowstone Park, at Tower Falls and Mammoth Hot Springs.

SCROPHULARIÀCEAE

FIGWORT FAMILY

These are herbs, shrubs, or trees, with opposite or alternate leaves without stipules, and perfect, irregular, and usually showy flowers. The organs of the flower are mostly in 4 series. The calyx is 4- to 5-parted or lobed, or sometimes split on the lower side or on both sides. The corolla is 2-lipped, or nearly regular. The stamens are 2, 4, or 5, inserted on the corolla alternate with its lobes, with anther-sacs equal or unequal, sometimes confluent into one. The pistil, standing above the insertion of the other organs, is composed of two carpels and is 2-celled by a partition through the middle, upon which the placentae and ovules are developed; the slender style bears at its summit an entire or 2-lobed stigma. The fruit is usually a capsule, partly or wholly enveloped by the persistent calyx, which splits down from the top to release the numerous seeds, very small, which are often pitted, ribbed, or otherwise marked, and contain a small embryo in a fleshy endosperm.

This is a large family of plants, consisting of about one hundred and sixty-five genera and twenty-five hundred species of widely differing form and habit. They are distributed over the whole earth, but chiefly in the temperate latitudes of both hemispheres. They are well represented in North America, and in the Rocky Mountains their numerous herbaceous members are among the most common and conspicuous elements of the flora. A few partially woody species which come within the northern region are discussed below.

Biologically the plants are of considerable interest, particularly in the high degree of specialization which the flowers in most cases present in the interest of pollen transfer by the agency of insects; in this respect the highly showy and irregular form of the corolla, the reduction and adjustment of stamens in various ways, the relation of stamens to style and stigma, and the appearance of some dimorphic flowers, as well as the unequal development of stamens and pistils in point of time, all indicate an unusual degree of regulation of the fertilization process. Although in the vegetative functions the plants are usually independent, several genera show marked tendencies toward parasitism through root contacts.

Plants of the Figwort Family have no great technical nor economic value, although some (*Verbascum, Digitalis, Scoparia*) are much used in medicine. Many of the most attractive wild and cultivated plants belong to this group, including the Beard Tongues (*Pentstemon*), Monkey Flowers (*Mimulus*), Foxgloves (*Digitalis*), Snapdragons (*Antirrhinum*), and many others.

PÉNTSTEMON

Mostly perennial herbs, but a few shrubby or half-shrubby within our range, as a rule branched from the base, with opposite, tough, somewhat whorled leaves, the upper sometimes alternate, and usually large, showy, blue, red, or purple flowers in ample terminal clusters. Calyx 5-parted; corolla irregular, the tube elongated, more or less enlarged above, 2-lipped, the upper lip 2-lobed, the lower 3-lobed. Stamens 5, one of them sterile with a brush-like tip, the others pollen-bearing, all usually shorter than the tube of the corolla. The ovary is ovoid, surmounted by a slender style and knob-like stigma, and matures into an oblong or globose capsule with two chambers and numerous small seeds, and opening from above downward into the cells.

The pentstemons are natives of North America from Canada to Mexico, nearly one hundred species being described from the Rocky Mountains.

Pentstemon Menzièsii Hook.

Shrubby Pentstemon. Fig. 69

A bushy or densely matted plant from a few inches to a foot high, the lower parts permanently woody, covered with a thin brown or grayish bark, the upper shoots dying back more or less from year to year, leafy; leaves thick, opposite, 1 to 2 inches long, ovate, obovate, or oblong, acute at the apex, narrowed to the short petiole at the base, margin serrate, with short, rather distant teeth, smooth or pubescent, at least when young; flowering shoots about 6 inches high, bracted; flowers 1 to 1½ inches long, calyx teeth lanceolate, pubescent, ⅛ to ½ inch long; corolla purple, tubular-funnelform, and moderately 2-lipped, bearded within; sterile filament short and slender, hairy at the apex or nearly naked; capsule ovate, about ⅛ inch long.

The range of this species is from Alaska and British Columbia to Alberta, and south to California and Wyoming. The following localities may be mentioned: in the Canadian Rockies, Bow River and North and South Kootenai passes; in Montana, in Unionville Gulch and near Lake Terry and Granite; in Idaho, on Mount Moscow, and near Rathdrum. It is found growing usually on rocky slopes and mountain tops. Because of its alpine and sub-alpine habit, this species seldom blooms before early July; it not infrequently blooms as late as the middle of August.

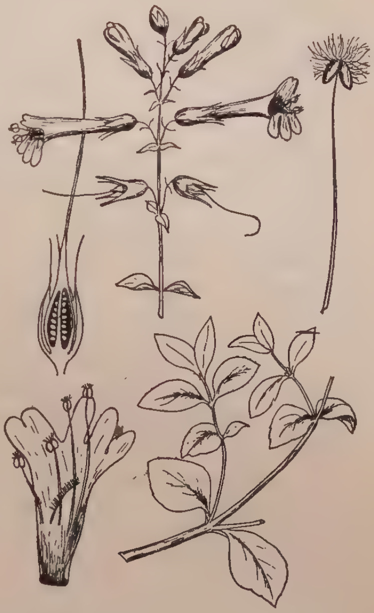

Fig. 69.—*Pentstemon Menziesii* Hook. Shrubby Pentstemon

Shoots about natural size. After Torrey and Gray.

The original description of *P. Menziesii* was written by Hooker in 1838, from material collected by Menzies on Nootka Sound in 1788. Gray recognized several varieties (*Scouleri, Newberryi,* etc.), some of which come within our range, and are now, at least by some authors, accepted as distinct species. In many respects, however, they are alike and, except in their extreme forms, identified with difficulty. *Pentstemon fruticosus* (Pursh) Greene is very similar to, and by some considered the same as *P. Menziesii.* It grows to greater size (1 to 3 feet), though in its structural features, as they appear in herbarium material, the two are scarcely distinguishable.

CAPRIFOLIÀCEAE

Honeysuckle Family

The members of this family are mostly shrubs, trees, or woody vines, with opposite, simple or compound leaves, and perfect, usually clustered flowers. Stipules are present in some cases and absent in others, and in some cases the flowers are regular, in others irregular. The ovary is inferior, appearing below the insertion of the various floral members. The normal relation of members in the floral parts is 5 each, in the calyx, the corolla, and the stamens, in alternating series, though in some cases these numbers are modified. The number of carpels varies from 5 to 2, united into an ovary with a corresponding number of cells, simple style, and small, lobed or entire stigma. In each cell of the ovary 2 ovules appear attached to an axial placenta. The corolla is either radially symmetrical, or 2-lipped, and may be either wide-open or bell-shaped, or long and tubular. The stamens are attached to the corolla, either near the base, or in the case of most tubular flowers at some distance above, the anthers usually oblong. The fruit ripens dry or fleshy in different genera; in the latter case it may be either a berry or drupe.

The family of the *Caprifoliaceae* includes about ten genera and over two hundred and fifty species, distributed mainly through the temperate regions of the Northern Hemisphere, but in a few cases reaching South America and Australia. And numerous fossil viburnums appear in the Tertiary strata of North America.

The points of chief biological interest in connection with the group concern their adaptations to pollination by insects, and there appears a considerable variety of floral structure. In the elders and viburnums the flowers are small and assembled in showy masses; in the latter cases sterile flowers, much larger and more conspicuous, are developed on the margin of the cluster. Some of the tubular flowers, like those of the honeysuckles, are visited by moths of the Sphinx group, and this fact is doubtless associated with the sweet odors exhaled especially after sunset, not only in these plants but in many other members of the family. Wasps visit the flowers of the Snowberry, and doubtless many other insects have a part in the service of pollination, as indicated by the general development of glandular tissue and the special positions assumed by anthers and stigmas.

As viewed from the economic standpoint, the uses of the family are few. The elder is widely used in household arts and medicine. The honeysuckles and viburnums are commonly planted as ornamentals.

KEY TO THE GENERA

Leaves compound .... *Sambucus*
Leaves simple
Erect shrubs or climbing vines
Flowers in terminal cymes...................... *Viburnum*
Flowers, at least some, in axillary clusters
Flowers regular
Flowers short, bell-shaped............... *Symphoricarpos*
Flowers long, funnel-shaped............. *Diervilla*
Flowers irregular .... *Lonicera*
Low trailing vine................................ *Linnaea*

SAMBÙCUS

ELDER

The elders are shrubs or small trees, with stout, very pithy branches and opposite, pinnately compound leaves, the leaflets variously toothed or cut, and small, usually white flowers in large terminal, conical, or flat-topped clusters. The calyx tube is ovoid or hemispheric, 3- to 5-lobed. The corolla is saucer-shaped or slightly bell-shaped, 3- to 5-lobed, regular, and the stamens 5, inserted on the base of the corolla, and alternate with its lobes, the filaments slender and the anthers oblong. The ovary 3- to 5-celled, with short, thick style and 3 to 5 short stigmatic branches. A single seed in each cell is pendant from the upper, inner angle. The fruit ripens as a small berry-like drupe, crowned by the persistent calyx.

About twenty species are known to this genus, world-wide in distribution, but more amply represented in the North Temperate Zone than elsewhere. Of the few North American species three or four occur in the northern Rocky Mountain region in moist soils and humid situations.

Although in the northern latitudes the elders are shrubs, one of the same species in the south becomes a tree 15 to 25 feet in height, with stem diameter of 10 to 12 inches. The growth of these plants is usually rapid, and even in the northern Rocky Mountains shoots make a growth from the base in one season to a height of 10 to 12 feet and a diameter of 2 inches. Some exotic species of *Sambucus* are herbs, spreading by suckers.

Key to the Species of Sambucus

Inflorescence not flat-topped	
Fruit red	1. *S. pubens*
Fruit black	2. *S. melanocarpa*
Inflorescence flat-topped	
Fruit black, without bloom	3. *S. canadensis*
Fruit blue, with heavy bloom	4. *S. glauca*

1. **Sambucus pùbens** Michx.

Red-berried Elder. Plate 32

A shrub, 3 to 12 feet high, with the young twigs green, sparingly pubescent with short hairs; leaves divided into 5 to 7 leaflets which are 2 to 5 inches long, lanceolate to ovate or oval, the apex extended into a long taper point, the base often narrowed and unequal, the margin sharply serrate, the upper surface smooth, the lower paler and more or less pubescent; petiole and midrib pubescent; stipules small, oblong, blunt; inflorescence 2 to 3 inches long, terminal on short shoots of the season, somewhat longer than broad, its branches covered with the same sort of pubescence as seen on the leaves; flowers white, turning brown in drying, about ⅛ inch broad; calyx tube oblong, ovoid, the margin bearing short blunt lobes; fruit scarlet or red, ⅛ inch in diameter, the nutlets minutely roughened.

Sambucus pubens is found from Nova Scotia to Alaska, and south to Georgia, Colorado, and Oregon. In the Canadian Rockies it is found about Glacier and Field, also commonly in the Selkirks. In Montana it occurs along bottom lands of streams and in narrow canyons and was collected near Missoula in Grant and Marshall gulches. It is found also in Yellowstone Park.

2. **Sambucus melanocàrpa** Gray

Black-fruited Elder

A shrub, 3 to 6 feet high, young branches reddish-green with a bloom, smooth; leaves divided into 5 to 7 leaflets, which are 3 to 6 inches long, ovate-lanceolate, varying to ovate or oval, abruptly taper-

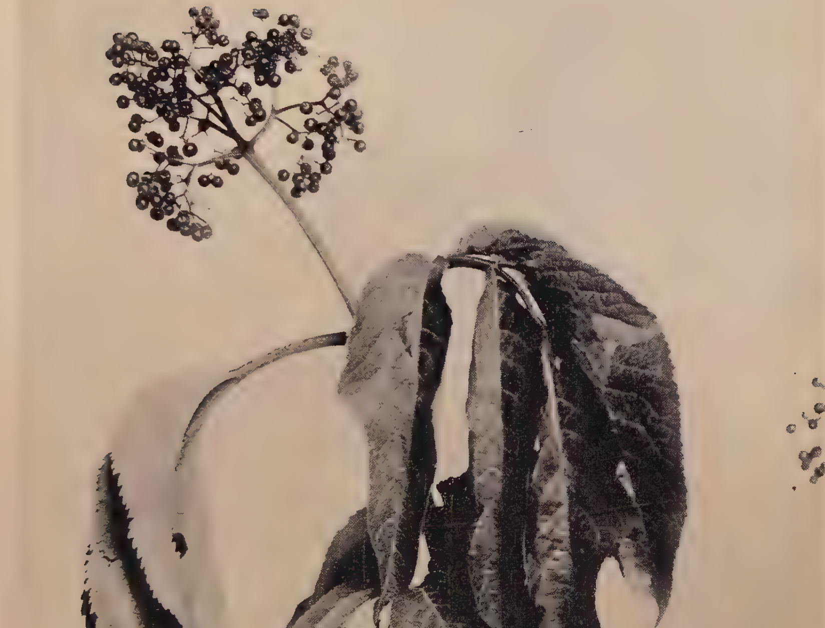

PLATE 32 (p. 288) *Sambucus pubens* Michx.

Red-berried elder from the vicinity of Missoula, Montana

pointed at the apex, often rounded but decidedly oblique at the base, the margin sharply serrate, surface smooth, or the younger slightly pubescent, dark green, paler beneath; petiole and midrib smooth; stipules small, round, scale-like deciduous; inflorescence 2 to 3 inches in diameter, convex, as broad as high, its branches smooth; calyx-tube ovoid, teeth mostly sharp-pointed; corolla white, about ⅛ inch in diameter, turning brown in drying; fruit black, without bloom, between ⅛ and ¼ inch in diameter.

The range of *S. melanocarpa* is from British Columbia to Alberta and south to New Mexico; in the Canadian Rockies, at Glacier and from Donald through the Selkirks; in Idaho near Silver City, Lake Waha, and in the Coeur d'Alene Mountains; in Montana near Missoula, Mullan Tunnel, Granite, Melrose, Bozeman, Spanish Basin, Bridger Mountains, and Pony; and in Yellowstone Park.

3. **Sambucus canadénsis** L.

Canadian Elder

A shrub 4 to 10 feet in height, smooth, the stems but little woody, but with ample white pith in the younger branches; leaflets 5 to 11, usually 7, each 2 to 5 inches long, ovate or oval, sharp or taper-pointed at the apex, acute or obtuse at the base and more or less oblique, variably serrate, the teeth often incurved at the points, both sides smooth, or the lower sometimes pubescent along the veins, bright green above, somewhat paler beneath; inflorescence 4 to 8 inches broad, 2 to 3 inches high, flat-topped, divided into several main and secondary rays; flowers white, about ⅛ inch broad or more; fruit deep purple or black, nearly ¼ inch in diameter; nutlets roughened.

This shrub ranges from Nova Scotia to Florida and west to Saskatchewan, Montana, Colorado, and Texas. Not often collected in Montana; reported from Deer Lodge.

This species is esteemed for its medicinal properties.

4. **Sambucus glaùca** Nutt.

Southern Elder. FIG. 70

A large shrub in the northern mountains, but in the southern part of its range becoming a tree 25 or more feet in height and as much as a foot in diameter, covered with a dark, close, and finely fissured bark, smooth throughout; leaves rather thick, divided into 5 to 9 leaflets

2 to 6 inches long, varying from lanceolate to narrowly oblong or ovate, sharp- or taper-pointed at the apex, rounded or oblique at the base, sharply serrate, usually with small teeth, light green above, pale beneath; inflorescence 3 to 8 inches broad, 2 to 3 inches high, flat-topped; flowers white, ⅛ to ¼ inch broad; fruit blue, with a heavy pale bloom, ⅛ to ¼ inch in diameter.

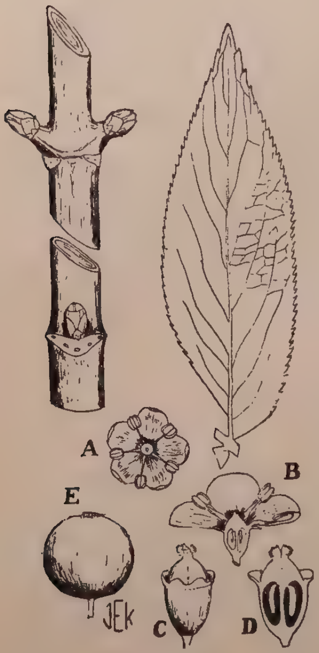

Fig. 70.—*Sambucus glauca* Nutt. Southern Elder

Stem natural size; leaflet, ×½; *A* and *B*, flowers, ×2 and ×3 respectively; pistil, *C* and *D*, ×6; *E*, fruit, ×2.

This species, which is found on the Pacific Coast from British Columbia to southern California, extends eastward to the Rocky Mountains from Alberta to Arizona, and is common in the mountain valleys of Montana, where it has been collected at Clinton and at Missoula. It also comes from Boise and from Nez Perce and Owyhee counties in Idaho and numerous places in eastern Oregon and Washington.

Some difference of opinion prevails concerning this plant, which also seems to be known as *Sambucus coerulea* Raf., *S. decipiens* Jones, and *S. ferax* Nels.

VIBÚRNUM

Within our range the viburnums are shrubs, elsewhere sometimes small trees, leaves entire, toothed or lobed, and flowers usually white, in terminal, compound clusters. The outer or marginal flowers in some species are sterile and enlarged. The calyx tube is ovoid or hemispheric, bearing 5 tooth-like lobes. The corolla is saucer-shaped or wide bell-shaped, the stamens 5, inserted on the corolla and exceeding it in length. The ovary is 1- to 3-celled, with short 3-lobed or 3-parted stigma, and the ovules solitary in each cell and pendulous from the upper end in the axial angle. Of the three carpels which normally unite to form the pistil in this genus, 2 are sometimes aborted, leaving but one functional. The fruit ripens as a small ovoid or globose drupe, with acid, fleshy exocarp, and usually compressed seed, with endosperm and minute embryo.

Over one hundred species of *Viburnum* are distributed through the North Temperate Zone, and south to northern Africa and the high mountains of Central and South America. About twenty species are known to temperate North America, and of these two appear in the Rocky Mountain flora.

The viburnums are grown as ornamental plants for their attractive flowers, fruit, and foliage. Some are evergreen and others deciduous, the flowers white or pink, and the fruits red, blue, or black, enhancing their attractive qualities. There are numerous exotic species in cultivation and many horticultural varieties, one of the most interesting of which is the familiar Snowball (*Viburnum Opulus*), in which all the flowers of the mass are sterile and enlarged, like the marginal ones of the native species.

Key to the Species of Viburnum

Inflorescence with showy marginal flowers.................1. *V. Opulus*
Inflorescence without showy flowers..........................2. *V. pauciflorum*

1. Viburnum Ópulus L.

Cranberry Tree

A shrub, 4 to 10 feet high, with erect, smooth branches, young twigs green, the older covered with a rough gray bark; winter buds scaly; ovate, opposite, smooth, flattened against the stem, about ¼ inch long; leaves 2 to 4 inches long, broadly ovate or broader than long, 3-lobed; the lobes taper-pointed, divergent, base of the blade rounded, margin coarsely toothed, nearly smooth above, but with some hairs on the margins and the veins beneath; petioles ½ to 1 inch long, glandular above; inflorescence terminal on short leafy shoots of the season, 3 to 4 inches broad, flowers white, the marginal ones ½ to ¾ inch broad, with neither stamens nor pistil, the inner flowers having both, about ⅛ inch broad, the calyx of these minute; fruit globose, ⅓ inch or more in diameter, red, acid, and translucent; stone round, flat, not grooved.

Viburnum Opulus is native to North America, Europe, and Asia in the cooler regions of the North Temperate Zone. In America its range extends from New Brunswick to British Columbia, and south to New Jersey and Oregon.

2. **Viburnum paucifl̀orum** Pylaie

Fig. 71

A straggling shrub, 2 to 10 feet high, with slender branches, the twigs and petioles smooth or nearly so; winter buds ¼ to ⅜ inch long, ovate, smooth, opposite; leaves 2 to 4 inches broad, usually somewhat broader than long, varying from nearly round to ovate, with 3 short lobes or none, the lobes when present either blunt or taper-pointed, the base broad, usually rounded, margin coarsely and unequally toothed, the teeth sharp-pointed, surface smooth above, more or less hairy on the veins beneath; inflorescence terminal on short lateral shoots of the season, which bear usually a single pair of leaves, rays short, the whole cluster ½ to 1 inch broad, the flowers all perfect and small, about ⅛ inch broad; calyx lobes much shorter than the tube of the corolla, thin, blunt; fruit globular or ovoid, light red, acid, about ⅓ inch long; stone round, flat, scarcely grooved.

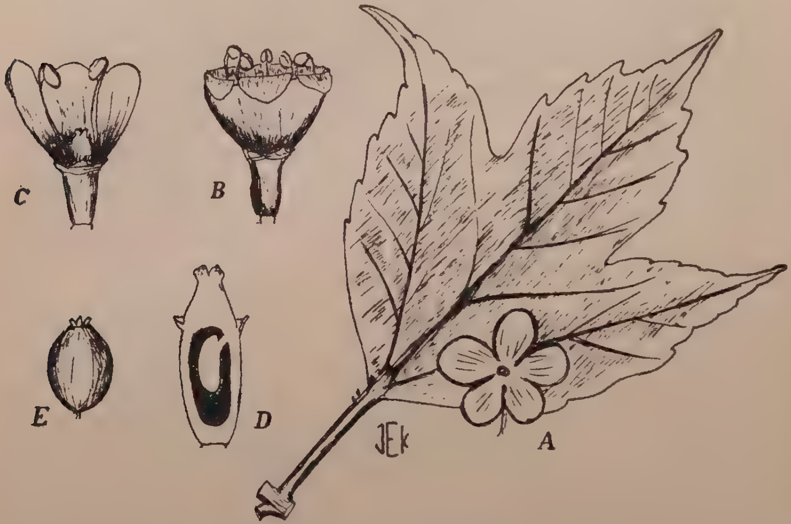

Fig. 71.—*Viburnum*

A–D, V. Opulus L., leaf and sterile flower; *A,* about two-thirds natural size; *B* and *C,* flower, ×4; *D,* ovary, ×8; *E,* fruit, *V. pauciflorum* Pylaie, natural size.

The range of *V. pauciflorum* extends from Newfoundland to Alaska, and south to New England, Pennsylvania, Colorado, and

Oregon. In Montana it has been found on South Mill Creek and the Flathead River; in the Canadian Rockies at Field, Banff, and Emerald Lake. It is a native of cold mountain woods.

SYMPHORICÀRPOS

The species of this genus are shrubs of low or medium height, with slender, upright, or sometimes half-prostrate stems. They often spread by suckers. The leaves are opposite, and the successive pairs at right angles to one another. Flowers appear mostly in axillary bunches, though often a larger terminal cluster is found at the summit of the stem. The calyx tube is ovoid or globular, surmounted by a limb of 4 to 5 teeth. The corolla, usually bell-shaped, may be white or pink, 5-lobed, often bearded within. Usually 5 stamens are present, standing alternate with the lobes of the corolla and inserted upon its tube. The ovary is 4-celled, the style simple and slender, the stigma knob-like. Two of the 4 cells of the ovary contain each a single ovule, pendent from the axis above; the other two cells bear abortive ovules and are sterile. Fruit a globose or ovoid, 4-celled, 2-seeded berry, usually white but in some species red or bluish-black, commonly borne in dense clusters and persistent into the winter. The small oblong seeds contain a fleshy endosperm and minute embryo.

This genus as far as known is almost exclusively American. The species sometimes so closely resemble one another as to make classification difficult and uncertain, so that their number is variously reported at from eight to fifteen. They are distributed mainly from British America to Mexico, and several are common in the Rocky Mountains. They are sometimes planted as ornamentals.

KEY TO THE SPECIES OF SYMPHORICARPOS

Fruit red	1. *S. orbiculatus*
Fruit white	
Leaves more than 1 inch long	
Style and stamens slightly exserted	2. *S. occidentalis*
Style and stamens not exserted	3. *S. racemosus*
Leaves less than 1 inch long	
Corolla about ¼ inch long	4. *S. vaccinioides*
Corolla nearly ½ inch long	5. *S. oreophilus*

1. **Symphoricarpos orbiculàtus** Moensch.

Coralberry

A shrub, 2 to 5 feet high, the twigs erect or ascending, purple or reddish-brown, pubescent, straight and slender, the bark on older stems becoming gray and shreddy; leaves 1 to 1½ inches long, ovate or oval, varying from acute to rounded at the apex, but mostly obtuse-pointed, usually obtuse-angled at the base, margin entire or undulate, the upper surface smooth or sparingly pubescent, the lower covered by a soft pubescence; petiole about ⅛ inch long, pubescent; flowers in small, compact clusters in the axils of the upper leaves, their short pedicels and bracts pubescent; calyx tube smooth, globose, the lobes broad, blunt-pointed, and hairy on the margins; corolla bell-shaped, about ⅙ inch long, sparingly bearded within; stamens shorter than the corolla; berry purple-red, ovoid or globose, ⅙ inch or less in length.

The Coralberry is distributed from New York to Georgia and west to Montana, Colorado, and Texas; in Montana, near Malta, along the bottoms of the Milk River.

This plant is known also as *Symphoricarpos vulgaris* Michx. The first description of the plant was written by Linnaeus as *Lonicera Symphoricarpos.* In 1892 MacMillan, following the rule of maintaining the oldest specific name, proposed the designation *Symphoricarpos Symphoricarpos,* under which the shrub appears in some manuals at the present time.

2. **Symphoricarpos occidentàlis** Hook.

Wolfberry. Fig. 72

A shrub, 2 to 4 feet tall, with erect, straight twigs, those of the season red, smooth or pubescent, longitudinally striate, the older branches changing to gray; leaves 1 to 3 inches long, ovate or oval, sometimes almost orbicular, rounded or bluntly pointed at the apex and base, margin entire or wavy, or on vigorous shoots even deeply toothed, the teeth rounded, surface smooth above and more or less hairy beneath; petioles up to ¼ inch long; inflorescence a dense, oblong or rounded cluster in the axils of the upper leaves, the bracts pubescent, pointed; calyx tube smooth, ovoid, the lobes ovate; corolla pink, bell-shaped, ¼ inch or more long, divided to below the middle into 5 oblong or ovate lobes; stamens slightly longer than the corolla; style smooth, about as long as the stamens; berry nearly globular, white, ¼ to ⅝ inch thick.

The range of *S. occidentalis* is from Michigan to Missouri and west to Oregon and British Columbia; in the Rocky Mountains, from British America to Colorado. Richardson allows it a range as far north as latitude 64°, and it is reported by Drummond and Douglas as abundant along the Saskatchewan and Red rivers; it is collected also in the Sarcee Reserve, Alberta. In Montana it is found in Greenough Park in Missoula, near Helena, in Madison and Gallatin counties, and in the Bridger Mountains and elsewhere. It is reported also from Electric Peak in Yellowstone Park, and from Kootenai County, Idaho.

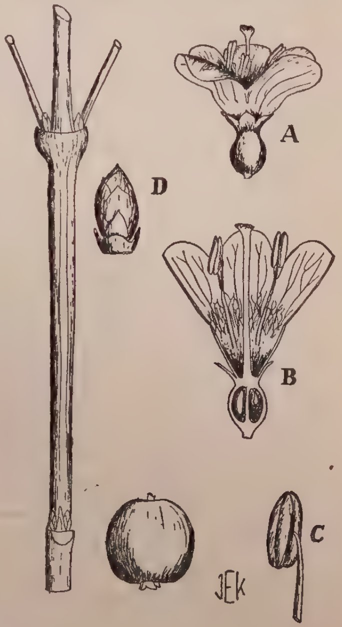

FIG. 72.—*Symphoricarpos occidentalis* Hook. Wolfberry

Twig and fruit natural size; flowers, *A* and *B*, ×2 and ×3 respectively; anther, *C*, ×5; bud, *D*, ×10.

3. Symphoricarpos racemòsus Michx.

Snowberry. PLATE 33

An erect shrub, 1 to 4 feet high, smooth throughout or nearly so, the young twigs slender, divergent, green or reddish in color, changing on older parts to a gray shreddy bark; leaves 1 to 2 inches long, oval, obtusely pointed at base and apex, entire or undulate on the margin, or on vigorous young shoots sometimes toothed, green above, paler beneath but smooth on both sides; flowers either in small, axillary clusters or in terminal racemes, calyx tube oval, smooth, lobes short, broad, variable in form; corolla bell-shaped, about ¼ inch long, scarcely cleft to the middle, the lobes ovate; stamens not longer than the corolla; fruit white, globose, ¼ to ⅓ inch in diameter.

This species has a range from Nova Scotia to British Columbia and south to Virginia, Colorado, and California. In the Canadian Rockies it is found at Field, Banff, and Emerald Lake; in Montana, at Missoula, Emigrant Gulch, and Jack Creek; in Yellowstone Park, on Electric Peak; and in Idaho, on Lake Waha.

The original collection of this species was made near Lake Mistassini in Canada, and described by Michaux in 1803. Subsequent observations and collections have brought to light other forms, which have been regarded either as varieties or distinct species, such distinctions being based mostly on the size of the inflorescence or on the surface characters of the leaves. According to some authors the variety, or species, known as *pauciflorus* is separated from the true *racemosus* by the few-flowered condition of the inflorescence and the strongly whitened and pubescent aspect of the lower surface of the leaf. *S. racemosus* is also known in some manuals as *S. albus* (L.) Blake.

4. **Symphoricarpos vacciniòides** Rydb.

A densely and intricately branched shrub, 1 to 3 feet high, with young twigs very light yellowish-brown and shining, the older stems covered with a dark grayish-brown and shreddy bark; leaves less than 1 inch long, oval, acutely pointed at base and apex, margin variable, surface dark green above, more or less glaucous beneath and either slightly pubescent or becoming smooth in age; corolla elongated bell-shaped, ¼ to ⅓ inch in length, petals rounded and merely spreading; berry white, ellipsoid, about ⅓ inch long and ¼ inch or more in diameter.

The plant is found from Alberta to Nevada and west to Washington. In Montana the following localities are cited: Lima, Forks of the Madison, Indian Creek, and German Gulch; in Yellowstone Park on Electric Peak. In Idaho it is reported from Montpelier and Mackay.

According to Rydberg this stands intermediate between *S. oreophilus* Gray and *S. rotundifolius* Gray. By others, however, it is regarded merely as a variety of *S. rotundifolius.*

5. **Symphoricarpos oreophílus** Gray

A shrub, 1½ to 3 feet high, smooth or somewhat pubescent; leaves less than 1 inch long, oblong to broadly ovate, acute or rounded at the apex, mostly rounded at the base, margin entire or somewhat dentate; flowers terminal or few in the axils of the upper leaves; corolla tubular or narrowly funnelform, with rounded, slightly spreading lobes, smooth within, 4 to 5 times as long as the rounded slightly spreading lobes; fruit white, ovoid, about ⅜ inch long.

The distribution of *S. oreophilus* is from Montana to New Mexico and west to Oregon and California. It is probably rare in the latitude of Montana.

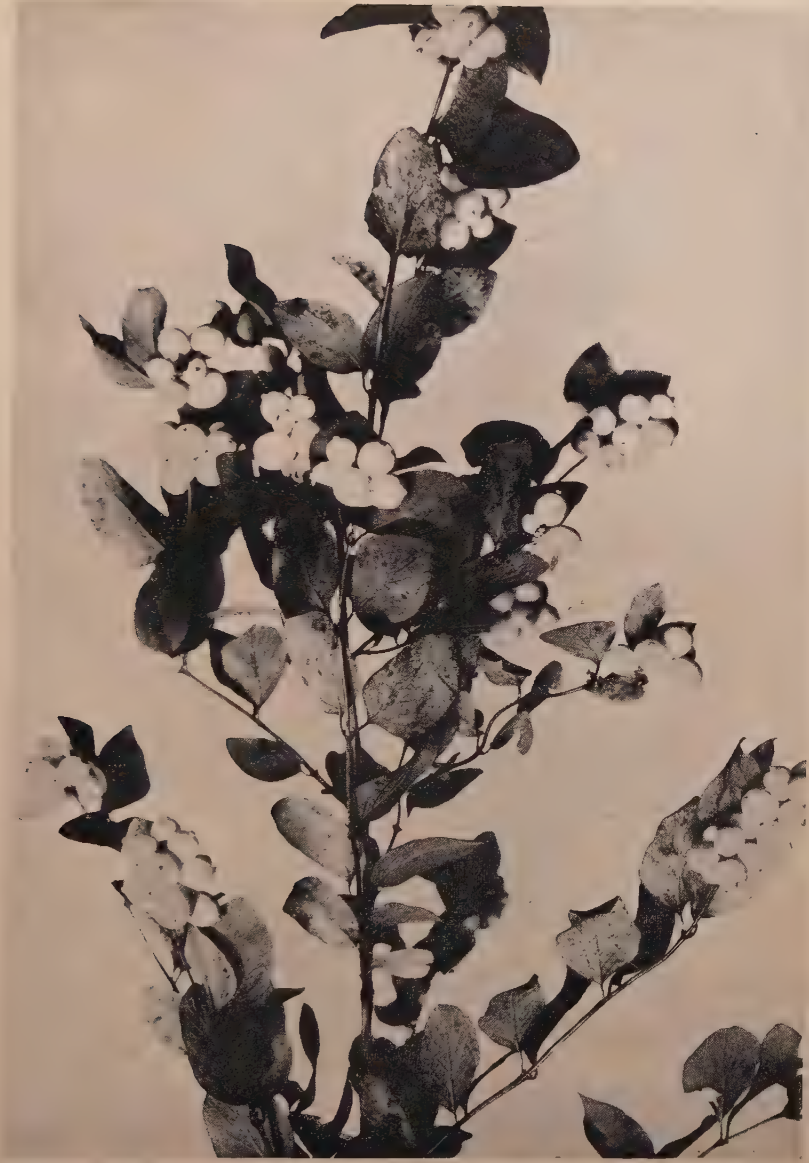

PLATE 33 (p. 295) *Symphoricarpos racemosus* Michx.

Snowberry from the vicinity of Missoula, Montana

DIÉRVILLA

The plants of this genus are shrubs with opposite leaves and yellow flowers, solitary or in clusters either terminal or in the axils of the leaves. The flower consists of a calyx divided into 5 slender teeth, a narrowly funnelform corolla with tube slightly distended at the base and 5 lobes about equal and regular, 5 stamens inserted on the corolla, the anthers linear, and a slender pistil with numerous ovules in a 2-celled ovary. The fruit is a linear-oblong capsule, narrowed above, opening into each cavity when mature to release the seeds. The seed-coat is minutely netted, the endosperm fleshy and the embryo minute.

About ten species of *Diervilla* are known, belonging to North America and eastern Asia, including those called *Weigela.* Most of them are prized as ornamentals and there are numerous horticultural hybrids and varieties.

Diervilla trìfida
Moensch.

Bush Honeysuckle.
FIG. 73

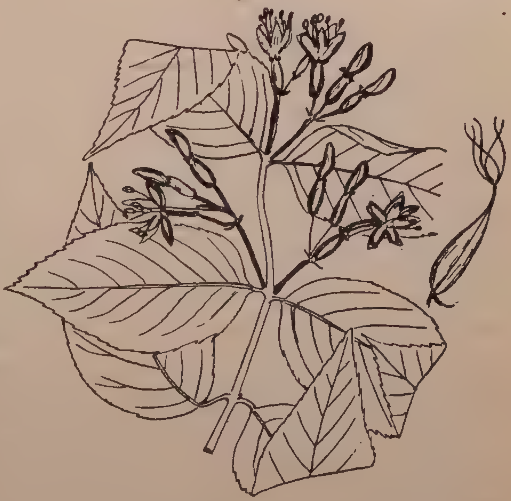

FIG. 73.—*Diervilla trifida* Moensch.
Bush Honeysuckle

Shoot about half natural size. After Britton and Brown.

A shrub, 2 to 4 feet high, generally smooth throughout, with round, slender, opposite branches, the shoots of the season invested at the base by the persistent bud-scales; leaf-scars and buds small, opposite; leaves 2 to 5 inches long, 1 to 2 inches wide, ovate or oval, taper-pointed at the apex, mostly rounded at the base, the margin serrate, sometimes slightly ciliate, usually smooth on both sides, or with a few hairs along the veins beneath; petioles about ¼ inch long; flowers in small clusters, terminal or in the upper axils, usually in groups of three, the middle one sessile or nearly so, stalks of the clusters ½ to 1 inch long, the subtending bracts very narrow, the whole flower about ¾ inch long; corolla more or less hairy without and within, funnelform, regular or slightly irregular, 5-lobed, 3 of the lobes somewhat united; capsule smooth, linear-oblong, crowned with the persistent sepals.

The range of *D. trifida* is from Newfoundland to the Rocky Mountains in Canada, and in the eastern part of the United States to North Carolina and Kentucky. Not yet reported from the Rocky Mountains in the United States.

LONÌCERA

Honeysuckle

The honeysuckles are erect or climbing shrubs with hollow or solid branches and opposite, mostly entire leaves. The flowers are often in axillary bunches or in terminal clusters. The cymose type of inflorescence prevails, and the flowers are frequently in pairs by the suppression of a third one standing between. The calyx is small, ovoid or globular, crowned by 5 teeth. The corolla is tubular, trumpet-shaped or bell-shaped, with 5 lobes, and may be either 2-lipped or regular, and is often puffed out more or less on one side near the base. Five stamens are inserted on the tube of the corolla alternate with its lobes and often exceeding its length. The ovary is 2- to 3-celled, with numerous pendulous ovules in each cavity, attached to the axis. The ovary is topped by a slender style with knob-like stigma. The fruit is a berry, usually 2- to 3-celled and few-seeded. The seeds are ovoid or oblong, with a fleshy endosperm and more or less cylindrical embryo.

Many species of *Lonicera* are known, according to some views over one hundred and seventy-five, natives of the North Temperate Zone around the world and extending somewhat into the tropics. They are well represented in North America, and five species are reported from the northern Rockies.

The genus *Lonicera* according to some authors is divided into *Xylosteon, Distegia,* etc., emphasizing certain groups that appear within the broader conception, which will be employed here.

These shrubs are often highly ornamental and attractive and in horticulture many varieties and hybrids are known. Exotic species have been freely introduced and are widely planted in parks and gardens.

KEY TO THE SPECIES OF LONICERA

Erect shrubs
  Flowers and fruit without husk-like envelope
    Fruit bluish-black .... 1. *L. coerulea*
    Fruit red .... 2. *L. utahensis*
  Flowers and fruit with husk-like envelope............... 3. *L. involucrata*
Vines
  Leaves ciliate on the margin.......................... 4. *L. ciliosa*
  Leaves not ciliate on the margin..................... 5. *L. glaucescens*

1. **Lonicera coerùlea** L.

Fly Honeysuckle

An erect shrub, 1 to 3 feet high, the smooth, red bark on older stems exfoliating in thin flakes; shoots of the season hairy; leaves 1 to 1½ inches long, ¼ to ¾ inch wide, oval, ovate or obovate, rounded or blunt at the apex, rounded or narrowed at the base, entire margined, pubescent with long hairs at least beneath and on the margins, or becoming smooth with age, conspicuously veined; flowers paired in the axils of the leaves, short-stalked, subtended by a pair of narrow bracts, much exceeding the calyx in length; the ovaries of the two flowers are united and the corollas only divergent; calyx border narrow, cup-like, scarcely lobed; corolla yellow, funnelform, ¼ to ½ inch long, often pubescent, the lobes equaling or shorter than the tube, the latter with a slight distension on the outer side at the base; stamens and style about as long as the corolla; fruit an oval, 2-eyed, bluish-black, sweetish berry, nearly ¼ inch in diameter.

The distribution of *L. coerulea* is around the world in the Northern Hemisphere, more common in northern latitudes. On the continent it is found in both Europe and Asia. In North America it is found from Newfoundland to Alaska, and south to Pennsylvania, Wisconsin, Wyoming, and California. In the Northern Rockies it grows in the open woods and is distinctly a plant of low, moist, though well-drained ground. It is found mostly at altitudes of 6,000 to 8,000 feet. Richardson refers to it as throughout the wooded country as far north as 66°, and Macoun states that it extends westward in the forest region to the northern part of British Columbia. In Yellowstone Park the following localities may be mentioned: North Fork of Gibbon River, Electric Peak, Yellowstone Falls, and Lone Star Geyser.

2. **Lonicera utahénsis** Wats.

Utah Honeysuckle. Fig. 74

Mostly a low shrub, but occasionally reaching 5 feet in height, with wide-spreading, slender branches, clothed on the older parts with a gray, slightly shreddy bark, the twigs of the season green and smooth; leaves thin, 1 to 2 inches long, ½ to 1¼ inches wide, oval, rounded at the apex or very blunt, rounded or broadly angled at the base, margin entire, both surfaces smooth or the lower with a few scattering hairs; petioles ¼ inch long or less; flowers paired on the ends of slender stalks ½ to 1 inch long, subtended by 2 opposite, slender bracts, about half as long as the ovaries, the latter divergent from the base and very slightly if at all united; ovary about ⅛ inch long, oblong, rim of the calyx minute, entire or wavy; corolla light yellow or white, tinged with purple, about ¾ inch long, funnelform, distinctly saccate on the outer side at the base, the lobes ⅛ to ¼ inch long; stamens about as long as the corolla, the pistil slightly longer; fruit red, globular, about ¼ inch in diameter or less, 2- to 4-seeded.

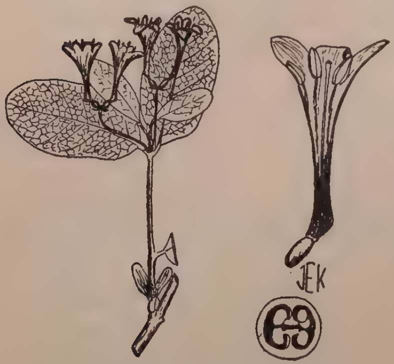

Fig. 74.—*Lonicera utahensis* Wats. Utah Honeysuckle

Shoot ×½; flower, ×1½; section through ovary, ×6.

This species is a plant of the Northwest, and is found from British Columbia to Alberta, Montana, Wyoming, and Utah; in the Canadian Rockies at Banff, Field, Emerald Lake, and Bear Creek Station on the Canadian Pacific Railroad; in Montana on Grant Creek near Missoula, near Deer Lodge and Bozeman, in Glacier Park, Silver Bow County, Spanish Basin, and Bridger Mountains; in Idaho near Hope and Lake Waha, and in the Coeur d'Alene Mountains and Kootenai County. It is a plant of the dry, wooded mountain sides from 3,000 to 7,000 feet elevation.

A very similar form was described by Rydberg as *L. ebractulata,* on the basis of the absence of secondary bracts, or bractlets, at the base of the ovary. Upon careful examination it seems scarcely distinguishable from *L. utahensis.*

3. **Lonicera involucràta** Banks

Husk Honeysuckle

A shrub, 3 to 10 feet high, finely branched, erect, shoots of the season green, smooth, changing on older stems to yellowish-gray or gray, with thin bark, leaf-scars and buds opposite; leaves 2 to 6 inches long, 1 to 3 inches wide, ovate, oval, or obovate, sharp or taper-pointed at the apex, narrowed or rounded at the base, the margin entire or wavy, ciliate, green on both surfaces, the upper smooth, the lower more or less pubescent, or becoming smooth with age; flowers yellow, paired, on stalks 1 to 2 inches long arising from the axils of the leaves, with a pair of large ovate or oblong bracts just below the flowers, and partly or wholly covering the bractlets, which enlarge and enclose the ripening fruit; corolla about ½ inch long, nearly cylindrical, pubescent, the tube about twice as long as the rounded lobes; stamens and style slightly longer than the corolla, berries paired, globose or oval, nearly black, about ⅓ inch in diameter, the large subtending bracts purple.

This species is widely distributed across the continent from Quebec and Ontario to British Columbia and Alaska, and south to Arizona and California; in the Canadian Rockies at Banff, Field, Glacier, Emerald Lake, Lake Louise, North and South Kootenai passes, and generally throughout the wooded country; in Montana in the Lolo Valley, near Deer Lodge, and Granite, in Silver Bow County, and along the Sun River; in Yellowstone Park at Yellowstone Lake and Apollinaris Springs; in Idaho at Tamarack and Lake Waha.

The plant was described by Banks in 1823 in the botanical report of Sir John Franklin's expedition, and in the same *Report* by Richardson as *Xylosteon involucratum;* it is known also as *Distegia involucrata.*

4. **Lonicera ciliòsa** Poir

Honeysuckle

A vine-like shrub, ascending over other shrubs or small trees, 10 to 20 feet in length, slender; leaves 2 to 3 inches long, ovate, the apex rounded or pointed, the base usually broadly wedge-shaped, margin entire, hairy, both surfaces smooth, the upper green, the lower pale with a whitish bloom, the upper pairs more or less united at the base, the pair nearest the end of the branch forming an oval blade through the center of which the stem passes; flowers usually in a terminal compact head or interrupted spike of 2 or 3 whorls, sometimes in small clusters in the axils of the upper leaves; ovary globose, the rim of the calyx narrow and bluntly toothed; corolla reddish-yellow or orange, 1 to 1¼ inches long, trumpet-shaped, distended on one side near the base, slightly 2-lipped above, the lobes about ¼ inch long; style and stamens about as long as the corolla; fruit red.

The range of this plant is from Montana to British Columbia, and south to Arizona and California; in Montana near Columbia Falls, Bigfork, Yellow Bay on Flathead Lake; in Idaho near Lake Waha and in Kootenai County.

5. **Lonicera glaucéscens** Rydb.

Shrub more or less twining, with light-colored, shreddy bark; leaves 2 to 3½ inches long, obovate or oval, nearly sessile, margin thick, not hairy, smooth and green above, covered with a bloom, and somewhat hairy beneath; flowers in a short, interrupted spike at the apex of the branch; ovary globose or ovoid, the rim of the calyx with broad teeth, or nearly entire; corolla yellow changing to red, an inch or less long, trumpet- or funnel-shaped, with a bag-like distension near the base, slightly hairy without, lobes about ¼ inch long; stamens and style slightly longer than the corolla; fruit red.

This species is distributed mostly eastward from the northern Rocky Mountains to the Atlantic Coast, and south from Alberta to Oklahoma, South Dakota, and Pennsylvania; in the British Rockies common; reported also from Banff, Field, and the Sarcee Reserve.

LINNAÈA

These creeping, vine-like plants are hardly entitled to distinction as shrubs, but their evergreen habit and slightly woody stems bring them within the category. Their leaves are opposite, petioled, broadly oval or round. One of the most distinctive features is the pair of flowers which appears at the summit of a slender naked stem. Calyx tube ovoid, crowned by a deeply 5-toothed rim. Corolla bell-shaped, with 5 lobes. The stamens, 4 in number, inserted low on the corolla tube, with unequal filaments and shorter than the tube. The ovary is 3-celled, 2 of the cells containing undeveloped ovules, the other with a functional one pendant from the axis. The slender style, about the length of the corolla, is capped by a knob-like stigma. The ovary ripens as a dry, 3-celled, but 1-seeded fruit. The seed is oblong, the endosperm fleshy, surrounding a cylindrical embryo.

But one species of *Linnaea* is known around the Northern Hemisphere. It is, however, exceedingly variable, as many as one hundred and fifty varieties having been described by a single author.

This beautiful little plant abounds in the forests of Sweden, the country of Linnaeus, and it was named for that distinguished botanist, whose influence is felt down to the present time through one hundred and sixty years of botanical history.

Linnaea boreális L.

Twin Flower. FIG. 75

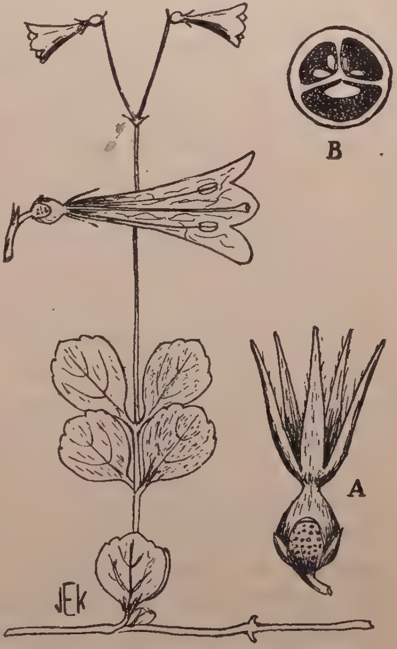

FIG. 75.—*Linnaea borealis* L.
Twin Flower

Shoot two-thirds natural size; flower, ×2; ovary and calyx, *A*, ×6; section ovary, *B*, ×12.

Stems slender, trailing, often 2 to 3 feet in length, pubescent, rooting often at the nodes; leaves thick, rarely as much as an inch long, usually about ½ inch, oval or round, sometimes broader than long, apex blunt or rounded, the base usually wedge-shaped, margin slightly toothed toward the apex, smooth or with a few scattering hairs; flowers paired at the top of a slender peduncle, which is the continuation of a short, ascending leafy shoot; the pedicels, about 1 inch long, arise from the axils of a pair of bracts; just beneath the ovary a pair of ovate, glandular scales closes about and nearly hides it; the ovary is ovate in form, hairy, the sepals about ⅛ inch long, hairy; corolla pink, bell-shaped, about ½ inch long.

In North America this plant reaches from the far north southward to New Jersey, Michigan, Colorado, and California. It is a very common plant in the northern Rocky Mountains, in the deeper woods, and the following localities may be indicated: in Yellowstone Park in the Grand Canyon, on Electric Peak, and near the Lower Falls; in Idaho near Lake Waha, and in the Coeur d'Alene Mountains; in Montana in the wooded bottoms of Lolo Creek near Woodman, in the Little Rocky Mountains, in Spanish Basin and Deer Lodge County, and near Granite; in the Canadian Rockies at Banff, Field, Emerald Lake, and Bear Creek Station.

Linnaea borealis is also known as *L. americana* Forbes. Another form which for a time was described as a variety, *longiflora,* was given specific distinction by Howell, as *L. longiflora,* on account of the slightly longer corolla. The species *L. borealis,* however, is exceedingly variable, as noted above, and the description as given covers all of the forms which to the writer's knowledge occur in the Rocky Mountains.

COMPÓSITAE

THISTLE FAMILY

The members of this family are mostly herbs, but in our region a number of shrubby species appear, and some exotic tropical forms are trees. They have a watery or resinous sap, but in the narrower conception of the family are rarely milky. The leaves are alternate, opposite or basal, and without stipules. The outstanding characteristic of the family is seen in the inflorescence in which numerous very small flowers are borne sessile on a common flat or convex receptacle, surrounded by an envelope of bracts, called an involucre. The flowers are often differentiated within the head into a marginal series known as the ray flowers, and a central mass called the disk flowers. The flowers usually have both stamens and pistils, but often either, and sometimes neither, the last case usually occurring in the ray flowers of a head in which the disk flowers are fertile. The disk flowers are regular, the ray flowers irregular by the radial extension of the corolla. The calyx is present in more or less modified form as scales, teeth, awns, or bristles, in most cases enlarging in fruit and serving as buoyant appendages. The corolla of the disk flower is usually tubular, borne on the summit of the ovary, its margin divided into 5 equal lobes. In nearly every genus of the family the anthers are laterally united to one another, forming a tube about the style. The pistil, consisting of 2 wholly united carpels, is differentiated into a usually oblong or linear ovary, which at the top is divided into 2 lobes or branches, bearing the stigmatic areas on their inner faces. In the young flower the two style branches are so approximated as to appear as one, but in the mature flower are more or less divergent. The ovary encloses a single chamber, occupied by one ovule in basal position. The fruit is an achene, formed of the ripened ovary containing a single seed and furnished commonly with a crown of bristles, known as the pappus.

This is the largest of the families of the seed-plants, containing over 10,000 species and having representatives in all parts of the world. They are especially abundant in America, particularly in the western plains and mountains. In the northern Rocky Mountains the shrubby members of the group are comparatively few, and may be listed under four or five genera and from fifteen to twenty species, but the herbaceous forms number probably one hundred genera and several hundred species.

As may be expected in a family of so great size and extensive geographic range, there obtains a remarkable diversity of form, size, and habit, of both genetic and ecological meaning. The *Compositae* inhabit chiefly the temperate and hot regions of the world. The prevailing forms in the north are herbaceous; in the south the woody species are abundant, but some of the latter upon approaching the colder latitudes become much less shrubby, being woody at the base only and producing a crop of shoots which are hardly more than annual, dying back from season to season.

The transfer of pollen from flower to flower is effected mainly by insects, though in some of the *Artemisias* and others it is apparently carried by the wind. The stamens as a rule mature first, and the anthers, facing inward, open into the space enclosed by them. The style, up to this time shorter than the stamens, now elongates and pushes the pollen before it out of the tubular space into which it was discharged; for this purpose the style is usually provided with a ring or cap of collecting hairs, which serve as a brush and sweep the pollen before them to where it can be caught by the wind or picked up by insects and transferred to the stigmas of the neighboring flowers. During this process the style branches are in close contact, but when thrust above the anthers they curve apart and expose their own stigmatic surfaces. Usually in the compact flower heads of the Thistle Family the flowers never all mature at the same time, and in some of the larger heads there is a regular succession from immature to fertilized flowers, thus facilitating the ready transfer of pollen from one to another.

The fruit presents various devices by which the dispersal of seeds is accomplished, the most common of which are the very effective means for utilizing the wind, as seen in the crown of pappus, and for attachment to moving bodies, exhibited by spines, hooks, and the like, either upon the ovary itself or upon the involucre. Not only is the family as a whole one of wide geographic distribution, but in many genera and species the individuals are exceedingly numerous, facts which testify to the efficiency of their means of propagation as well as to their wide ranges of adaptability from the physiological standpoint.

The family has a wide range of economic uses, some of which are important. Some shrubby species yield gum, which as a source of rubber either has or may become commercially profitable (*Parthenium, Chrysothamnus*), many have medicinal properties (*Matricaria, Arnica, Artemisia, Calendula*), some have long been a source of dyestuff (*Carthamnus*) and volatile and fixed oils (*Pyrethrum, Madia*), while still others are used as foods, as the Artichoke (*Cynara*) and the Jerusalem Artichoke (*Helianthus tuberosus*), the latter mainly as fodder for cattle. Probably few families have contributed as many beautiful members to the garden flora as have the *Compositae,* considering the Daisies, Asters, Chrysanthemums, Dahlias, and many others in their multitudes of horticultural varieties and hybrids, and our native flora is splendidly enriched by Aster and Goldenrod, Erigeron and Gaillardia, Sunflowers, Groundsels, and others in bewildering numbers.

KEY TO THE GENERA

- Receptacle naked
  - Bracts of the involucre well imbricated
    - Heads radiate .... *Aplopappus*
    - Heads discoid .... *Chrysothamnus*
  - Bracts of the involucre little imbricated........... *Tetradymia*
- Receptacle chaffy .... *Artemisia*

APLOPÁPPUS

The plants of this genus are herbs or low shrubs of various aspect and foliage. The flowers are in solitary heads terminating the branches or sometimes assembled in narrow or broad clusters. The heads are usually many-flowered, and in the species described here are all provided with yellow disk and ray flowers. The involucre consists of overlapping scales, with or without leaf-like tips. The receptacle is flat or nearly so, more or less pitted or toothed. The style branches end in elongated tips and the ovary ripens into achenes of varying form, rounded, ridged, or angled, and crowned with a pappus of unequal, copious, and ridged, hair-like bristles.

Over one hundred species of *Aplopappus* are known, distributed mainly from the United States west of the Mississippi River to Mexico, and in South America to Chile, Argentina, and Patagonia. They are an abundant part of the western plains and Great Basin flora, in which some forty to fifty species have been recognized.

The genus *Aplopappus* is here treated in its more inclusive sense. Numerous groups under the original *Aplopappus* have been named *Ericameria, Macronema,* etc., but the difficulty of differentiating clearly between these segregates renders them inconvenient and unreasonable for the present purpose. A few shrubby forms of *Aplopappus* appear within our range.

KEY TO THE SPECIES OF APLOPAPPUS

Leaves linear, heads about ¼ inch high..................	1. *A. nanus*
Leaves oblanceolate-linear, heads about ½ inch high.......	2. *A. suffruticosus*

1. Aplopappus nànus Eaton

A low, heath-like shrub, 4 to 12 inches high, of rounded form, the branches crooked, rigid, harsh, covered with a rough, gray or brown bark, the young twigs smooth and more or less gummy; leaves crowded, ¼ to ¾ inch long, usually about ½ inch, linear, or linear-spatulate, sharp-pointed at the apex, channeled on the upper side, smooth, often with minute leaves fascicled in the axils; heads ¼ to ⅓ inch high, solitary or in terminal clusters, an inch or less in breadth; involucre top-shaped, of numerous lanceolate, keeled papery scales with very sharp points, the outer ones small and passing into the leaves; ray-flowers 4 to 6; disk-flowers 8 to 9, as long as the rays, the corolla tube narrow, deeply 5-cleft; branches of the style in the disk-flowers linear, pointed, the hirsute appendages much longer than the stigmatic portion; achenes slender, smooth or pubescent, angled.

The range of this species is from Washington and Oregon to Idaho, Utah, Nevada, and California, and possibly enters the Rocky Mountains of southwestern Montana. In Idaho it is reported from Shoshone Falls.

It was first collected by Nuttall "on shelving rocks in the Blue Mountains of Oregon, and described as *Ericameria nana,* and later was collected by King's Expedition to northern Nevada and Utah, and described by Eaton as *Aplopappus nanus.* Another form which Nuttall found growing with the one above described he designated *E. resinosa* on the ground of its having somewhat larger and not perfectly yellow flowers, branches more slender and open, and the leaves somewhat larger; but this has not always been considered by later botanists as specifically distinct.

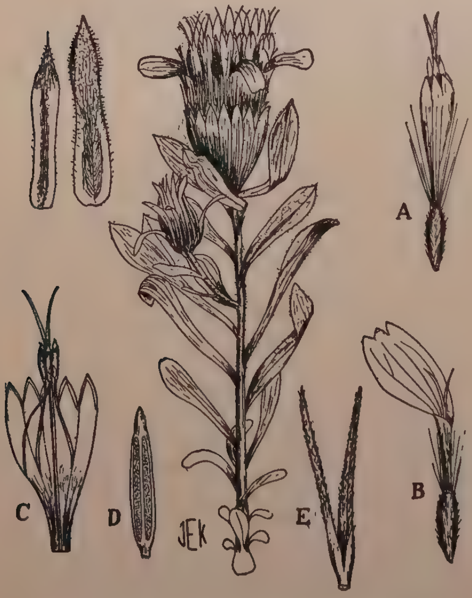

FIG. 76.—*Aplopappus suffruticosus* Gray. Shoot, ×1½; bracts, ×2½; flowers, *A* and *B*, ×2; *C*, flower, ×3; *D*, anther, and *E*, stigma, ×7½.

Aplopappus nanus has been examined for rubber and found to contain 9.57 per cent in material collected near Benton, California.

Aplopappus suffruticòsus

Gray

FIG. 76

A low, much-branched shrub, 6 to 8 inches high, the lower branches thick, woody, the shoots of the season more or less herbaceous, leafy to the summit and covered like the leaves with small glandular hairs; leaves ¾ to 1½ inches long, about ⅛ inch broad or more, linear to oblanceolate, sharp-pointed at the apex, narrowed to the base, entire; heads solitary or several in a terminal cluster, ½ to ¾ inch high; involucre top-shaped, its scales long, narrow, acute, the outer often green, leaf-like, the inner papery, with thin, ragged margins; ray-flowers 3 to 10, at first twice as long as those of the disk; disk-flowers about 30; style branches long, filiform, much longer than the corolla; achenes linear, pubescent.

This species is found from Oregon to California and east to Montana and Arizona, and the other Rocky Mountain states. It was first collected by Nuttall in the Blue Mountains of Oregon and described by him in 1840. While originally described as *Macronema,* this was also placed by Eaton in *Aplopappus.*

Another and closely related form was described by Rydberg in 1900 as *Macronema grindelifolium* on the basis of somewhat broader and less sharply pointed leaves. This was collected in Gallatin County, Montana, and on Sepulchre Mountain and Electric Peak in Yellowstone Park. The difference, however, appears to be very slight, as far as can be determined by the original or later descriptions.

CHRYSOTHÁMNUS

Rabbit Brush

The species of *Chrysothamnus* are mostly shrubs with narrow, alternate leaves, and usually small heads of yellow flowers without rays, commonly flowering in the autumn. As a rule the flower-heads are borne in broad clusters at the top of the stems, are 5- to 30-flowered, the flowers being all perfect and with tubular corollas. The involucre is formed of several series of dry, papery, or leathery scales, with green tips. The receptacle is flat, pitted or toothed. The style branches are terminated by appendages varying from ovate-lanceolate to needle-like. The ovary ripens as a narrow achene, round or angular, but slightly if at all flattened, crowned by a copious pappus of unequal, or in some cases nearly equal, capillary bristles.

These plants are natives of the western plains from British Columbia to Mexico. There is a wide range of varying opinion on the specific distinctions proposed among the members of the genus, and the genus itself approaches *Aplopappus* to such a degree as to make its separation in certain cases seem arbitrary. The frequent and puzzling intergradations between many of the forms give them more the aspect of varieties than species. The genus is also known as *Bigelovia.*

Key to the Species of Chrysothamnus

Stems pale, with matted hairs.............................. 1. *C. nauseosus*
Stems green, never woolly.................................. 2. *C. viscidiflorus*

1. **Chrysothamnus nauseòsus** (Pall.) Britton

Rabbit Brush. Fig. 77. Plate 34

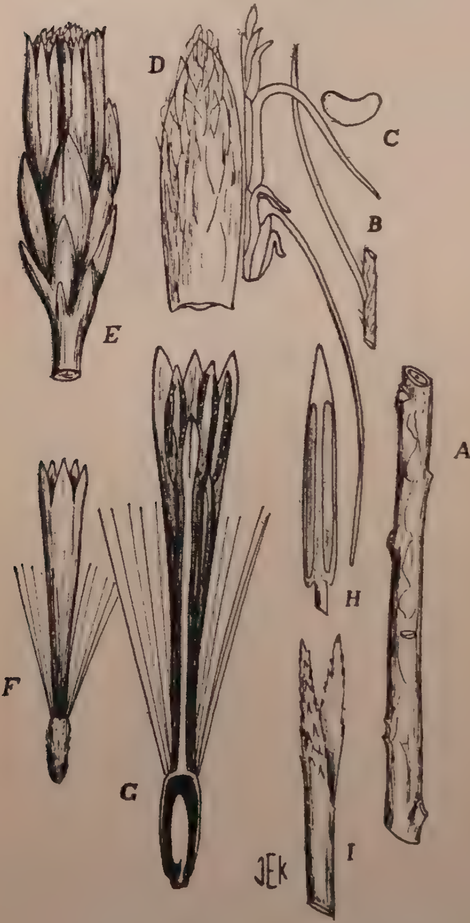

Fig. 77.—*Chrysothamnus nauseosus* (Pall.) Britton. Rabbit Brush

A, stem one year old, ×2; *B* and *C,* leaves, ×1 and ×14 respectively; *D,* bract, ×7; *E,* flower-head, ×3½; *F* and *G,* flowers, ×4 and ×7 respectively; *H,* anther, and *I,* stimga, ×10.

A shrub of rounded form, 1 to 6 feet high, or in some cases of higher stature and arborescent, with numerous flexible branches diverging at narrow angles, round, often striate, the lower and older stems clothed in a rather thick, rough, gray bark, the younger twigs varying from white to green, clothed with a fine pubescence, sometimes woolly, but often so densely matted as to resemble a hairless epidermis, especially when infiltrated with a resinous gum which some forms of the plant exude, the whole plant with a dense, bushy, leafy aspect in the growing season; leaves 1 to 3 inches long, usually less than ⅛ inch wide, linear, ordinarily with a single longitudinal vein but sometimes with 3, sharp at the apex and narrowed to the sessile base, the margin entire, rolled toward the lower side, bearing on both surfaces the same sort of pubescence which characterized the twigs;

heads yellow, rayless, ½ inch or more in height, very numerous, in brush-like clusters several inches in width, with slender stalks and narrow bracts; involucre narrowly bell-shaped, consisting of 4 to 5 vertical ranks of narrow scales with strong keels, thin colorless margins and usually sharp points; corolla about ⅓ inch long, the lobes lanceolate, ⅕ or less the length of the tube; pappus copious, of slender, soft bristles; achenes linear.

The distribution of this species extends from Utah to Montana and west to California, Oregon, and Washington. In Montana it has been collected at Great Falls, Plains, Lolo Valley, along Bighole River above Divide, and elsewhere.

The wide diversity of form within the genus *Chrysothamnus* has led to the greatest difference of opinion regarding the distinctions between the species. The original description of *C. nauseosus* was based upon one of the white, hairy forms, yet the intergradations which may be found abundant in one locality or another render very uncertain the points at which the line of distinction may be drawn between this and other forms, which have come to be known as *C. speciosus* Nutt., *C. graveolens* (Nutt.) Greene, *C. frigidus* Greene, and others. Forty-two forms within what is here indicated as the *Nauseosus* group have been given publication, all but eight have been described as species at one time or another, and doubtless this number might easily be increased. *C. nauseosus* is characterized by a remarkable matted pubescence on the young twigs. To quote Hall: "It is fully recognized that pubescence characters often furnish but a treacherous basis for constant species, yet in this instance the nature of the pubescence is so unlike that in any other species of the genus, and it is so obviously correlated with habit and other minor characters that it seems certainly to indicate a natural group. This felt-like covering of the twigs is more or less infiltrated with a resinous substance. In some forms the surface is loose and fluffy, the tomentum thus more or less completely masking the striae of the stems. In these forms the surface is usually light gray or dull white, or even almost pure white, and the loose tomentum extends even to the involucres. In other forms the surface of the tomentum is firm and smooth, thus revealing the striae. In these forms the twigs are dull to bright yellowish-green in color or rarely somewhat whitish and the involucres are mostly glabrous."

In the paper above quoted many forms by other authors ranked as species are treated as varieties. While for the purpose of this book it seems unnecessary and unprofitable to dwell upon varietal distinctions, for the sake of those working in the field and in order to identify the variations of *C. nauseosus* with current specific descriptions, the following criteria are presented. Typical *C. nauseosus* in the narrower sense is recognized chiefly by its permanent white pubescence throughout. From this *C. graveolens* differs mainly in its green aspect and broader leaves and more crowded inflorescence. *Chrysothamnus frigidus,* besides having the twigs whitish with a smooth, closely felted tomentum, in which respect it stands intermediate between *C. nauseosus* and *C. graveolens* and is of smaller size than either, is differentiated from *C. plattensis* by leaves erect instead of spreading, and in having all the bracts instead of merely the outer ones somewhat hairy on back and margins. In *C. speciosus* Nutt. the leaves of the flowering twigs are often crowded and the dimensions of the plant somewhat in excess of *nauseosus,* and the characters used to differentiate it from *C. pulcherrimus* Nels. are shorter leaves and the hairless margins of the bracts.

2. **Chrysothamnus viscidiflòrus** (Hook.) Nutt.

A shrub, 6 inches to 6 feet high, with a broom-like branching habit, sometimes sticky-resinous, never woolly, on older stems grayish-brown with shreddy bark, the younger twigs smooth and green; leaves 1 to 2 inches long, 1/16 to 1/8 inch broad, linear in the typical form, but varying from almost filiform to oblong, the broader ones with 3 parallel veins, the apex acute, the base narrow and sessile, the margin entire, the blade usually twisted, smooth, or with a minute, harsh pubescence; heads sometimes few in a compact bunch, but often many in a broad, broom-like mass with slightly convex top, the bracts of the inflorescence usually narrow, pointed, 1/4 to 1/3 inch high; bracts of the involucre comparatively few, 2 to 4 in each vertical rank, from broadly to linear oblong or lanceolate, blunt or sharp-pointed, not rarely some of the outer with firmer and distinctly greenish apex; flowers yellow, 4 to 5 in each head, the corolla deeply cleft into oblong, lanceolate lobes, about 1/6 or less the length of the tube, style appendages narrow, pointed, usually only half the length of the stigmatic portion; pappus of rough bristles; achenes covered with appressed hairs.

The range of *C. viscidiflorus* covers most of the western part of the United States from the Dakotas to Washington and from British America to New Mexico, Arizona, and southern California. It is common in the northern Rockies, where the following localities may be mentioned: in Canada, in the upper valley of the Columbia River; in Idaho at Mackay and Flint Creek; in Montana in the hills bordering Blanchard Flats on the north in the Blackfoot Valley, on hills

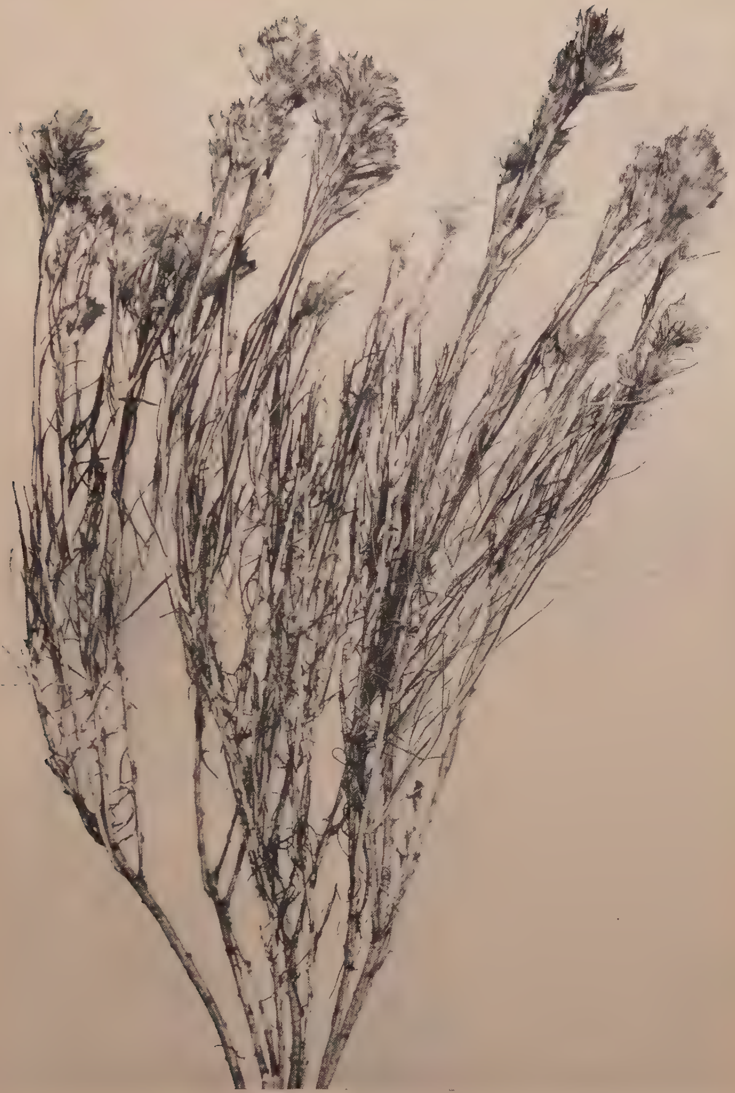

PLATE 34 (p. 310) *Chrysothamnus nauseosus* (Pall.) Britton

Rabbit brush from the Bighole Valley

along the Bitterroot River near Missoula, on the Little Blackfoot River, near Logan, Billings, and Gardner, and in the Belt Mountains.

Here again a series of intergrading forms centers about *Chrysothamnus viscidiflorus*. These, sometimes ranked as varieties, sometimes as species, are included in the foregoing description and may be enumerated as *C. stenophyllus* (Gray) Greene, *C. pumilus* Nutt., *C. latifolius* (D. C. Eaton) Rydb., *C. lanceolatus* Nutt., and *C. puberulus* (D. C. Eaton) Greene. As one places specimens of these forms from various sources side by side he is impressed by a gradual gradation from one type of leaf to another, and from one form of inflorescence to another. Outside of these marks it is difficult to distinguish between them, as for instance in the matter of surface and floral characters. Though differing in size, in branching habit they are very similar. *C. stenophyllus, C. pumilus,* and *C. puberulus* represent the very narrow-leaved forms, while *C. latifolius* and *C. lanceolatus* those with the broadest leaves, *C. viscidiflorus* being intermediate. In differentiating the last three it seems to be largely a question of the breadth of the leaf. *C. puberulus* is set off by its somewhat more evident, though still very short, pubescence, and *C. pumilus* and *C. stenophyllus* are also marked by minute differences in the width of the leaves, both being less than 1/12 inch broad and the former wider than the latter.

TETRADÝMIA

These are low and rigid shrubs, often spiny by modification of the leaves, the leaves and branches covered with a white coating of matted hairs. The leaves are alternate, entire, and bearing small tufts of secondary leaves in their axils. The flower-heads are without rays, the involucre cylindrical or oblong, formed of 4 to 6 concave, overlapping scales, and the receptacle small, flat, and naked. The heads commonly contain 4 flowers, with corolla elongate cylindrical, yellow, the lanceolate spreading lobes longer than the short, bell-shaped throat. The anthers are sagittate at the base and triangular at the apex, and the style branches flat, with short, blunt tips. The achenes are round, short, marked by 5 vertical lines and crowned by a pappus of numerous fine, white, minutely roughened bristles.

About 6 or 7 species of *Tetradymia* are known, belonging to western North America, especially in the semi-arid plains of the Southwest.

Key to the Species of Tetradymia

Plants not spiny
  Branches and leaves permanently woolly.................. 1. *T. canescens*
  Branches and leaves becoming smooth.................... 2. *T. glabrata*
Plants spiny .... 3. *T. spinosa*

1. Tetradymia canéscens DC.

Fig. 78

A pale shrub, 1 to 3 feet high, permanently whitish with a close matted pubescence, spineless, often with a broom-like branching habit, the bark on older stems rough or shreddy; leaves ½ to 1 inch long, linear, sometimes spatulate or oblanceolate, with a sharp smooth point at the apex, narrowed to the sessile base, entire, covered on both sides with matted hairs; heads in small, rather compact clusters, which are broader than high, the whole head half an inch or more high, the involucre about ⅔ the length of the head, composed of 4 broad, hairy, and more or less keeled bracts with blunt points; achenes silky hairy.

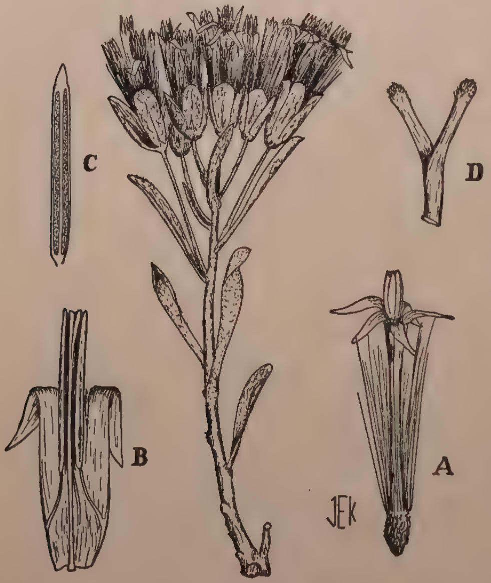

Fig. 78.—*Tetradymia canescens* DC. Shoot natural size; *A* and *B*, flowers, ×2 and ×4 respectively; *C*, anther, and *D*, stigma, ×5.

The range of *T. canescens* is from British America to California and Utah; in Idaho it occurs at Lava and Powell; in Montana, at Helena, Gardner, Great Falls, and Deer Lodge, occupying foothills and plains.

According to some authors the range of *T. canescens* is confined to the Pacific Slope from Idaho and Utah westward, and to Montana, Colorado, Utah, and Nevada, largely on the eastern side, representing the distribution of *T. inermis,* a smaller species, with more tufted and less woody growth and slightly broader leaves. While *T. inermis* was originally described by Nuttall as a species (1840), it was later (1876) considered by Gray as a variety of *T. canescens.* In spite of the fact that some botanists of the present day have restored the specific distinction of *inermis,* it must be remembered that plants usually become less robust and often otherwise modified toward the borders of their natural ranges, and that the species in question may furnish a case in point.

2. **Tetradymia glabràta** Gray

A shrub, 1 to 3 feet high, with slender, spreading branches, at first whitish with a thin coating of hairs, which are at length deciduous, the branches roughened by numerous small, lump-like spurs from which the usually fascicled leaves have fallen, the older bark gray and shreddy; leaves ¼ to ½ inch long, linear, the primary ones appressed on young shoots and very sharp-pointed, the secondary rather blunt, spreading, at length quite smooth and green; heads about ½ inch high, on short stalks, crowded toward the ends of the shoots or in terminal clusters an inch or more broad, the scales of the involucre 4, blunt, sometimes becoming smooth with age; corolla with narrow, oblong or linear lobes; achenes hairy.

This species according to present knowledge hardly comes within our range, being confined mostly to Oregon and California, and extending east to Idaho and Utah and Nevada. It possibly reaches southwestern Montana. In Idaho it occurs on Reynolds Creek, Owyhee County.

3. **Tetradymia spinòsa** Hook. & Arn.

A shrub, 2 to 4 feet high, with rigid branches, white with a close-matted woolly pubescence, thorny by the transformation of primary leaves, the thorns straight when mature, slender, up to 1¼ inches long, the surface of the stems changing from white to green and then to gray; leaves fascicled in the axils of the spines, fleshy, about ¼ inch long, slender, smooth; heads of 6 to 7 flowers, about ½ inch high, on stout woolly peduncles arising from the tufts of leaves in the axils of the spines, involucre about ⅔ the length of the head, consisting of 5 to 6 oblong, blunt, hairy scales; lobes of the corolla narrow, oblong, recurved; achenes covered with long soft, white wool, nearly equaling the pappus.

Tetradymia spinosa has a range from Montana to Nevada, Colorado, Oregon, and California. In Montana it has been found along the Bighole River in Beaverhead County.

ARTEMÌSIA

Sage Brush

Plants of this genus are herbs or shrubs with alternate leaves, the herbage having the odor of sage and a bitter taste, the leaves often dissected, and the flowers usually yellow and in small heads without rays. The scales of the involucre are dry and more or less thin-margined, appressed and overlapping in a few series. While all the flowers are tubular they are often of two kinds, the outermost pistillate, the inner and more numerous being perfect and either fertile or sterile. The corollas of the pistillate flowers are slender and small, 2- to 3-toothed, those of the perfect flowers enlarged above and 5-toothed. The anthers usually have narrow tips. The receptacle varies from flat to hemispherical, naked, or sometimes hairy. The achenes are obovoid or oblong, mostly rounded at the apex and with a rather small terminal areola, and almost always smooth. The pappus usually wanting.

The species of *Artemisia* constitute a large genus, natives of the Northern Hemisphere and abundant in both the Old and the New World, the principal center of distribution being in northern Asia. In North America they abound on the semi-arid plains of the West, where various species are known as sage. Over seventy species are described by one author, including the herbaceous forms. Of the shrubby members there are probably six or seven species that come within our range.

The plants of this group are often known as wormwood. Some of the species of *Artemisia* are grown for drug products, *A. Absinthium* L. being among the chief sources of absinthe. Others, like *A. Stelleriana* Bess. (Dusty Miller), *A. Abrotanum* L. (Old Man), and *A. vulgaris* L., are propagated as ornamentals.

Key to the Species of Artemisia

Plants spiny .... 1. *A. spinescens*
Plant without spines
    Leaves entire .... 2. *A. cana*

Leaves not entire
Leaves merely toothed at the apex
Inflorescence large, compound.................... 3. *A. tridentata*
Inflorescence narrow, simple..................... 4. *A. nova*
Leaves more or less deeply lobed
Lobes usually short, tooth-like.................. 5. *A. arbuscula*
Lobes linear
Inflorescence compound .... 6. *A. trifida*
Inflorescence usually simple.................... 7. *A. rigida*

1. **Artemisia spinéscens** Eaton

A shrub, a foot or two high, with stout, spreading, and rigid branches bearing spines formed by the persistence of slender greenish twigs after having borne leaves and flowers, the older stems clothed with a gray, shreddy bark, the younger covered with a gray wool; leaves less than ½ inch long, divided into linear or spatulate, finger-like divisions to the number of 3 to 5, covered with straggling hairs; heads globose, somewhat over ⅙ inch in diameter, nearly sessile along the slender tapering branches which later become the spines, bearing 5 to 12 flowers, of which about one-fourth are in marginal position, pistillate and fertile, the rest perfect but sterile, the corollas of the former truncate, of the latter with a narrow, bell-shaped tube and 5-lobed rim; achenes oblong or ellipsoid, hairy.

The range of *A. spinescens* is from eastern Oregon to Wyoming and south to California and New Mexico. In Montana it is reported from Beaverhead County, but probably is rare. It is a plant of the alkaline plains, and was first collected by Douglas and then by Nuttall, who described it in 1840 under the name *Picrothamnus desertorum.* It was referred to *Artemisia* by D. C. Eaton in the *Botany of King's Expedition.*

2. **Artemisia càna** Pursh

A shrub, mostly 1 to 3 feet high, freely branched, erect, with a gray aspect due to a close pubescence on twigs and leaves, the older branches becoming smooth and straw-colored, and finally clothed with a gray, shreddy bark; leaves ½ to 2 inches long, ⅛ to ¼ inch wide, linear or lanceolate-linear, acute at both ends, sessile, usually entire, or bearing near the apex 2 or 3 small teeth, clothed on both sides with appressed and matted silvery hairs; inflorescence a dense, elongated cluster of small heads, each scarcely ⅛ inch broad and high, containing 5 to 9 yellow flowers and enclosed by an involucre of hairy bracts.

Artemisia cana is found from Saskatchewan to Nebraska, Montana, Wyoming, Colorado, Utah, Washington, and Oregon. In Canada it extends from the plains of the Saskatchewan southwest to the Rocky Mountains at Calgary, and south to the boundary. In Montana it is found near Havre, Bozeman, Livingston, and Baker; in Yellowstone Park, near Yellowstone Falls and Yellowstone Lake.

3. **Artemisia tridentàta** Nutt.

Sagebrush. Fig. 79. Plate 35

A pale-gray shrub reaching a maximum height of 12 feet, usually 2 to 4 feet, with numerous erect or ascending branches, the young twigs covered with closely matted hairs, later giving place to a gray, shreddy bark, which grows darker with age; leaves ½ to 1¼ inches long, usually wedge-shaped, with 3 teeth at the broad apex, and narrowed to the almost sessile base, some of the upper leaves entire, both surfaces gray with appressed hairs; heads 5- to 8-flowered, about ⅛ inch long, very numerous, in large clusters at the tops of the branches, bracts of the involucre nearly or quite as long as the flowers, the outer woolly; flowers yellow or greenish.

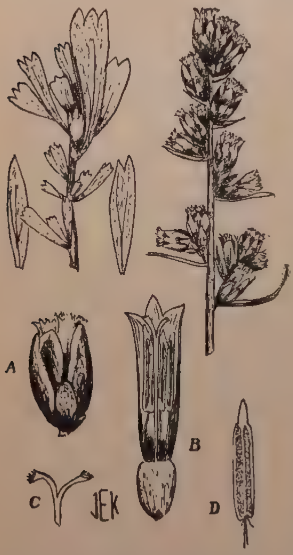

Fig. 79.—*Artemisia tridentata* Nutt. Sagebrush

Leafy shoot ×1½; flowering shoot, ×2; *A*, flower-head, ×5; *B*, flower, ×14; *C*, stigma, and *D*, anther, ×20.

This is one of the most widely distributed and common species of the genus, being found from Nebraska to California and from British Columbia to Mexico. In the Canadian Rockies it is found on the Flathead River; in Montana, very common in certain parts on foothills, as in the Bitterroot Valley near Stevensville, along the Bighole River above Divide, at Barratts on the Oregon Shortline Railway, along the Belt River, and near Helena; in Yellowstone Park, near Yellowstone Falls; in Idaho, about Boise.

In this case also variations have led to divergent views, certain apparent modifications being known either as varieties or species (*trifida, angusta, rigida,* etc.) according to the

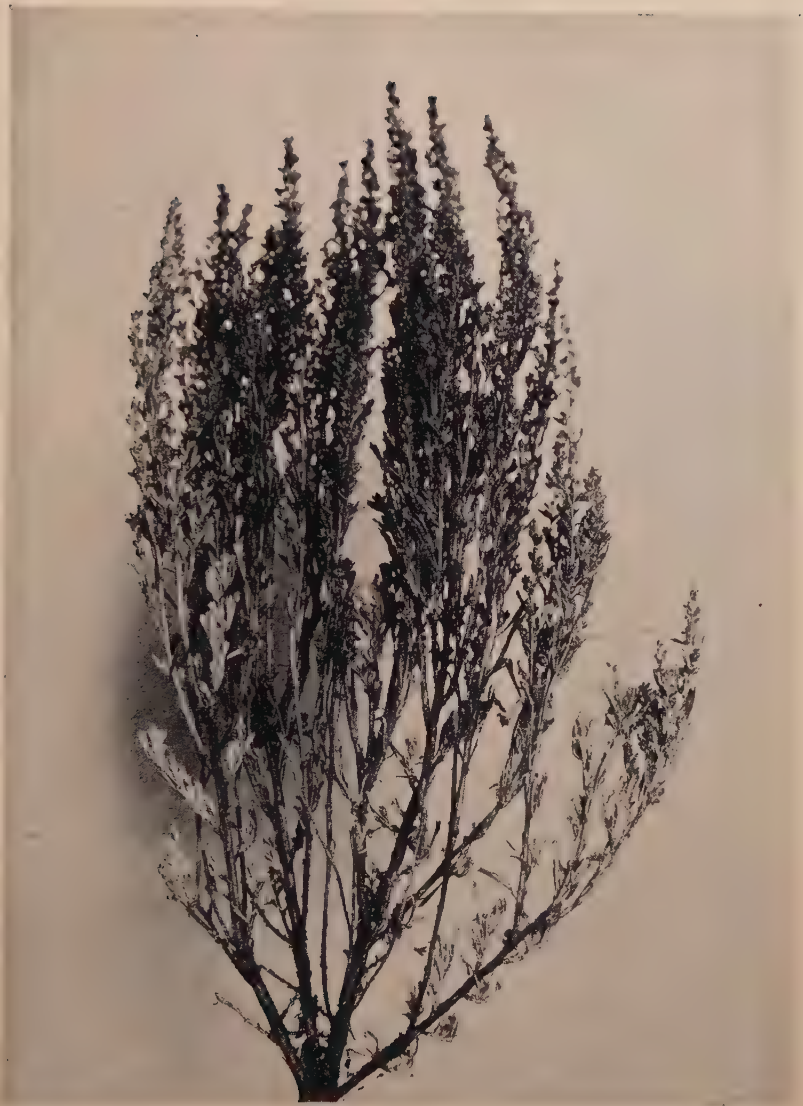

PLATE 35 (p. 318) *Artemisia tridentata* Nutt.

Sagebrush from the Bighole Valley

inclinations of authors and the material at hand. These are described as species below, in view of the easily recognizable vegetative characters which the extreme forms assume, without attempting to fix definitely the validity of the distinctions.

4. **Artemisia nòva** Nels.

A shrub usually less than 1 foot high, from a low and widely branching base, the older parts covered with a shreddy bark, the younger slender, erect, with some of the pubescence characteristic of the preceding species, but sometimes of a distinctly green cast; leaves very narrowly wedge-shaped, ½ to ¾ inch long, 3-toothed at the apex, the middle tooth longest, gray with closely matted pubescence; heads numerous, ⅛ inch or more in length, in narrow, crowded clusters at the tops of slender, leafless shoots, usually 3-flowered but often having but 1 or 2; involucral bracts closely overlapping, greenish, only slightly and minutely hairy; achenes smooth; resinous dots on the tube of the corolla only.

This plant is found from Montana and Idaho to New Mexico and Arizona. It was collected at various places in Wyoming by Nelson, who described it in 1900 as a new species. It was long considered but a dwarf form of *A. tridentata.*

5. **Artemisia arbúscula** Nutt.

A shrub, mostly 8 to 12 inches high, much divided into spreading or ascending branches, the older members clothed with a thin, rough, gray bark, the twigs of the season pubescent; leaves ¼ to ½ inch long, wedge-shaped, the truncate apex usually divided into 2, 3, or more oblong lobes, or the uppermost entire, both surfaces gray with a close-matted pubescence; inflorescence narrow, at the top of slender, erect, sparingly leafy branches; heads one or more, sessile in the axils of upper leaves or bracts, ⅛ inch or more high, less than ⅛ inch broad, 5- to 9-flowered, the bracts of the involucre elliptic, hairy.

The range of *A. arbuscula* includes Washington, California, Nevada, Wyoming, Idaho, and probably southwestern Montana. One specimen has been observed from Ketcham, Blaine County, Idaho, and another collection is on record from Upper Geyser Basin in Yellowstone Park. It is also reported, though perhaps doubtfully, from Ennis and Redersburg in Montana.

6. **Artemisia trífida** Nutt.

A gray shrub 1 to 2½ feet high, the twigs often in broom-like bunches, when young covered with white, matted pubescence, later giving place to a gray, shreddy bark; leaves ½ to 1½ inches long, very slender and deeply 3-parted into linear lobes, the lobes sometimes again divided, completely covered with closely matted hairs; heads less than ⅛ inch high, numerous, crowded toward the tops of slender branches; flowers yellow, 3 to 9 in each head; bracts of the involucre differing, the outer short, pubescent, the inner broad, mostly smooth, thin, as long as the head.

The range of *A. trifida* is from Montana to British Columbia and south to Colorado and Nevada; in Montana on Blanchard Flats in the Blackfoot Valley; also in Yellowstone Park.

7. **Artemisia rígida** (Nutt.) Gray

A low shrub usually less than a foot high, with a thick, woody base, producing a profusion of rigid and slender branches in broom-like bunches, the older stems covered with a thin gray bark, the younger twigs and foliage gray by reason of the thick investment of matted hairs; leaves also rigid, usually less than 1 inch long, entire or deeply 3-cleft, the lobes of the undivided blade narrowly linear or spatulate, both sides alike in the dense gray pubescence which completely covers the surface; heads mostly solitary in the axils of the leaves on slender twigs, hardly more than ⅛ inch high, less than ⅛ inch broad, 5- to 12-flowered, bracts of the involucre oval, thin margined.

The range of this species is comparatively narrow, it being reported up to the present time only from eastern Oregon and Washington and Idaho. It may enter the Rocky Mountains in the southeastern part of Idaho and adjacent Montana. Nuttall in 1840 described the plant as a variety, *rigida,* of *Artemisia trifida,* which it closely resembles in the appearance of its leaves, but from which it seems to differ in the characteristically solitary, sessile flower-heads, instead of the more ample flower clusters of *A. trifida.*

APPENDIX

BOTANICAL TERMINOLOGY

The structural features employed in the classification of the seed plants, to which group belong all the trees and shrubs of the northern Rocky Mountains, are presented briefly in order that the accompanying descriptions of the species may be comprehended by those without previous botanical training. Any discussion of the organs of plants involves the use of terminology, which to the beginner may seem cumbersome and formidable, but to avoid all technical terms would render the descriptions equally cumbersome with circumlocutions and puerile substitutes. It is not necessary to acquire a large vocabulary of new terms in order to understand the foregoing descriptions, but some knowledge of flower and fruit, stem and leaf are essential. Likewise it is important to gain some conception of the relative values and variability of the various structures.

The Seed.—The seed consists of an embryo-plant enclosed in a protective covering. The embryo is usually differentiated into a *radicle,* which develops into primary root and stem, one or more *cotyledons* or seed-leaves, and sometimes also the rudiments of the first true foliage leaves, the *plumule.* In certain families the embryo is commonly accompanied by a nutritive substance, *endosperm,* which wholly or partially surrounds the embryo but is not a part of it. The presence or absence of this tissue and its character, whether oily or mealy, is often an important fact to be taken into account in the classification, but as a rule other and more obvious features accompany this, by which a plant may be determined. Enclosing the structures above described is the seed-coat, or *testa,* which serves to protect the embryo from mechanical injury or decay, and is usually hard, resistant, variously colored, smooth or rough, and frequently appendaged in some way, favoring dispersal by wind, animals, or other agency.

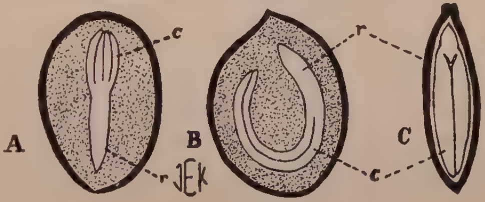

FIG. 80.—Structure of seeds

A and *B* with and *C* without endosperm. *A,* gymnosperm (Pine); *B* and *C,* dicotyledons; *c,* cotyledons; *r,* radicle.

The number of cotyledons is of fundamental importance in the classification of the seed-plants, the vast majority of which have either one or two. Those having one cotyledon are known as *Monocotyledons,* of which our own woody plants furnish but a single example, the Yucca; most plants having two cotyledons are known as *Dicotyledons,* and include all of our hardwoods. The softwoods, or *Gymnosperms,* have two or more cotyledons.

The Fruit.—Seeds are always borne attached to a *carpel,* unless we except those of supposed axial origin—a morphological distinction that does not here concern us. The carpel may stand alone or united with others to form the fruit. Very small fruits, containing one chamber, which do not open to release the single seed which they bear, often have the appearance of seeds and are commonly called such (e.g., fruits of Clematis, Cinquefoil, Sagebrush). In these the functions of the testa are usually assumed by the enveloping carpel, which also is provided with the devices for dispersal. Such small fruits are called *achenes.* Other fruits which do not open differentiate the carpel into an outer fleshy or fibrous *exocarp,* and an inner bony layer, *endocarp,* called the stone, containing a seed with thin testa. A fruit of this kind is called a *drupe,* and may be composed of one or more carpels and contain one or more cells and one or more seeds. The fruits of the blackberry type consist of aggregates of small drupes, each a *druplet.* The *nut* or *nutlet* is a similar fruit in which the carpellary wall is dry or hard, differing not much from the achene in some cases. Also this term is sometimes loosely used to mean the endocarp of a drupe. Many fruits are of the capsular type, with more or less characteristic manner of opening, *dehiscence.* Such are dry,

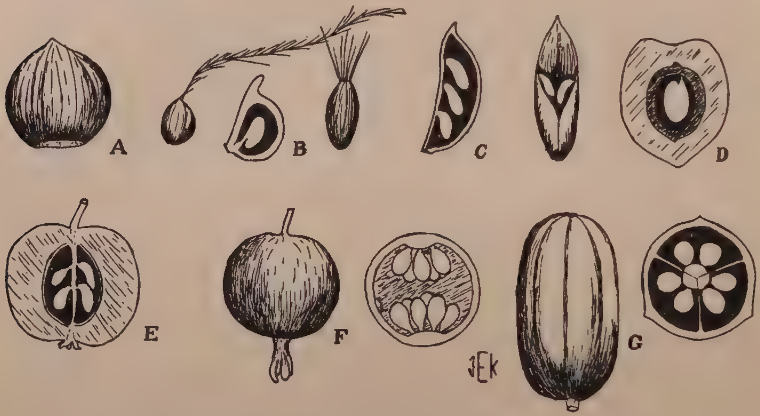

FIG. 81.—Types of fruits
A, nut; *B,* achene; *C,* follicle; *D,* drupe; *E,* pome; *F,* berry; *G,* capsule.

often thin-walled, and are listed under a variety of special terms; such are: *follicle,* consisting of a single carpel and opening by the ventral suture, *i.e.,* toward the axis of the flower (Ninebark, Spiraea); *capsule,* a fruit composed of two or more carpels, opening along the line of the sutures or elsewhere (Cottonwood, Willow, Yucca, Syringa). There are also several types of fruit of the fleshy sort, consisting of two or more carpels, not opening to discharge the seeds. Such include the *berry,* in which the carpels remain fleshy throughout (Currant, Gooseberry, Snowberry, Honeysuckle), and the *pome,* of which the apple is a familiar example. In this the somewhat woody carpels are fused with the fleshy tissue of the receptacle (Service Berry, Hawthorn, Mountain Ash).

The Flower.—The flowers of seed plants have a vast range of structure, form, and size, but the most essential feature common to all is the presence of either *stamens* or *pistil,* usually of both. The floral envelope, *perianth,* may be entirely lacking, or may consist merely of *bracts,* or of *sepals* (collectively *calyx*), or of *petals* (collectively *corolla*), of either of these singly, or all or parts of them in combination. They stand in order from the center of the flower outward, pistil, or pistils, stamens, corolla, calyx, bracts. In Gymnosperms the pistil is replaced by the seed-bearing scale, which does not enclose the seed, as does the carpel in the Angiosperms. This fundamental difference forms one of the most marked lines of cleavage between these two main divisions of the seed plants. The pistil is usually differentiated into *ovary, style,* and *stigma,* and may consist of one carpel or of several united. Within the ovary are one or more *ovules,* which in time mature as seeds, attached to a *placenta,* which may be in one place or in several. The *carpel* is in the individual, ovule-bearing unit of the pistil, equivalent in rank to a stamen; where

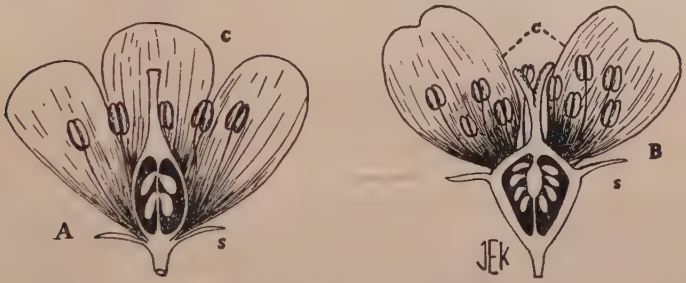

FIG. 82.—Parts of the flower

A, hypogynous flower (superior ovary); *B,* epigynous flower (inferior ovary); *s,* sepals (calyx); *c,* petals (corolla); *a,* stamens; *p,* pistil.

several of these are united they may usually be identified by their vertical lines of union, or *sutures*. The ovules are usually borne on the infolded margins of the carpels, which often extend to the center of the cavity, dividing it into cells, in each of which normally one or more ovules lie. The style may be very short or wanting, but the stigma is always present and represents a specialized area at the top of the pistil for the reception of the pollen from the stamens, essential for the fertilization of the ovules. In the Gymnosperms this stigmatic surface is entirely wanting and the pollen falls directly upon the ovule. The ovules may be fully exposed in this group only at the time of pollination. In the Angiosperms, however, the pollen does not come to rest upon the ovule, but the male germ cell reaches it only through the delicate *pollen-tube,* which traverses the intervening tissue. The ovule contains the female germ cell with which the male germ cell unites, giving rise to the embryo formed in the seed.

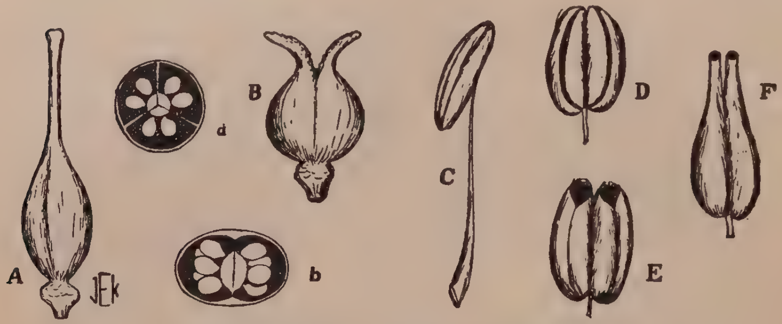

FIG. 83.—Parts of the pistil and stamen

A and *B,* pistils; *a* and *b,* sections of the same; *C,* stamen; *D, E, F,* anthers showing types of dehiscence.

The stamens are commonly formed in numbers greater than the carpels and are much less often united. In Gymnosperms they are not associated with the ovule-bearing scales, but in the Angiosperms they usually occur in the same flower, *perfect,* although they are often produced in separate flowers, *diclinous,* or on separate plants, *dioecious,* or they may occur in the diclinous and perfect condition on the same plant, *polygamous.* As a rule the stamen consists of three parts, the *filament,* or stalk, the *anther,* which bears the *pollen,* and the *connective,* which joins the anther and the filament. The anthers open when mature and expose the pollen, which is conveyed to the stigma by wind, insects, or other means. The manner and conditions of pollen-transfer are determined by an extraordinary diversity in number, position, form, and size of the floral organs, affording many intricate and ingenious devices for effecting cross-fertilization.

The petals, wanting in the lowest members of the Dicotyledons, form a series of leaves immediately beyond the stamens, as a rule becoming more conspicuous with the advancement of the plant in the scale of evolution, in the simpler forms free from one another, in others united to form a saucer-shaped, funnelform, or tubular corolla, in the lower members of a series regular and equal, in the more highly specialized becoming irregular or two-lipped, often in a very marked degree. The corolla is usually more delicate in texture and more highly colored than other parts of the floral envelope, and often much larger.

The sepals are the outermost of the four series of proper floral members, and are usually green, and serve as a protective envelope for the more delicate structures of the flower while in the bud. It frequently happens that sepals assume the appearance and function of a corolla, where the latter is absent, as in *Clematis, Atragene,* or become petal-like where both are present, as in *Aquilegia.* Sometimes they are entirely absent (Willows), or are especially modified for purposes of dispersal (Greasewood, Rabbit Brush).

Bracts, while not strictly a part of the flower, are commonly associated with flowers as small scale-like or foliaceous appendages subtending the individual flower stalk, *pedicel,* or groups of flowers, as in the Birch and Alder, or closely crowding up under the calyx, as in the Oregon Grape, or again forming an *involucre* below an inflorescence, as in the Flowering Dogwood and the Composites. The bracts are sometimes conspicuous in size and color, doing duty as a perianth, or they may serve as sail-like appendages of the fruit (Saltbush), or may compose the scaly parts of inflorescences (Alders and Birches).

The tissue upon which are inserted the various floral organs is known as the *receptacle,* or *torus.* The former term is also applied to the shortened axis bearing the flowers of the Composites. As a part of the flower, however, it is subject to modifications more or less characteristic of certain groups of plants. Thus in the Rose Family we may find it convex, as in the Raspberry, or concave, as in the Rose. In the former case it is evidently merely an enlargement of the axis bearing the pistils and other organs of the flower; in the latter it apparently becomes concave by the elevation of its margin, enclosing the pistils within the concavity, and bearing stamens, petals, and sepals upon the contracted margin. The swollen inferior part of the receptacle thus simulates an ovary. In the Gooseberries and Currants this effect is enhanced by the fusion of the receptacle with the backs of the carpels, and the part of the receptacle above the union becomes saucer-shaped, or bell-shaped, or elongated into a tube. In such cases the ovary is often said to be *inferior,* in contradistinction to the *superior* ovary prevailing in the majority of seed-plants, where the other organs of the flowers are clearly inserted below the pistils.

Flowers are borne solitary or in masses of different sizes and forms. Two general types of inflorescence prevail, the *racemose* and the *cymose.* The former consists of an axis, theoretically of unlimited growth, on which flowers are arranged laterally, leaving the apex free to continue its elongation; the latter is characterized by the immediate termination of the axis by a flower, stopping its growth, and the secondary axes, which arise from the side of the primary one, are likewise terminated, and so on. Indefinite expansion of the inflorescence of the cymose type is possible only by this process of lateral branching. The usual guide to the racemose or cymose character of an inflorescence is in the position of the bracts, in the axils of which the subordinate branches of the inflorescence stand. The simplest form of inflorescence is the *raceme,* in which the central primary and indefinite axis bears lateral flowers on distinct pedicels. This undergoes modification in a variety of ways; the flowers may be sessile on the primary axis, forming a *spike;* the lateral axes may be branched, bearing two or more flowers each, forming a *panicle;* when the raceme or panicle, or cyme, is narrow, compact and elongated, with unisexual flowers, it is called a *catkin,* or *ament;* when the raceme or panicle

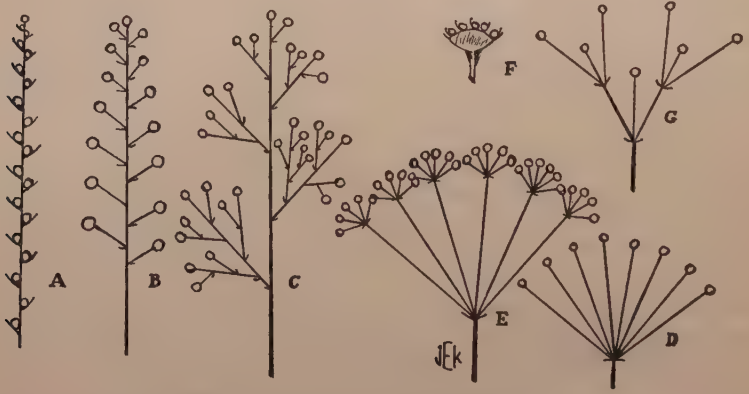

FIG. 84.—Types of flower clusters

A, spike; *B,* raceme; *C,* panicle; *D,* umbel; *E,* compound umbel; *F,* capitulum or head; *G,* cyme (dichasium).

becomes broad and short by the elongation of its lower branches it is termed a *corymb;* when the rays or pedicels or both in a raceme or panicle become equal, radiating from a common base, an *umbel* is formed, simple or compound; the shortening of the axis, bearing sessile flowers in a congested mass, produces a *head,* or *capitulum.* The most common form of inflorescence of the cymose type is the *dichasium,* in which two flowers stand opposite on the axis of a preceding one.

The Leaf.—The leaves of plants present an almost infinite variety of form, size, color, surface, texture, and structure, which has

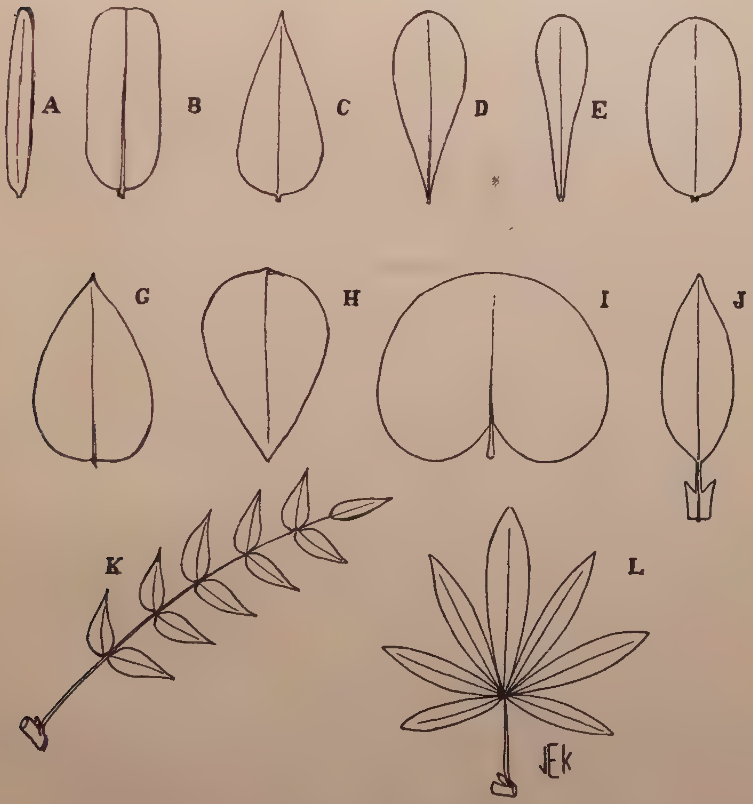

Fig. 85.—Forms of leaves

A, linear; *B,* oblong; *C,* lanceolate; *D,* oblanceolate; *E,* spatulate; *F,* oval; *G,* ovate; *H,* obovate; *I,* reinform; *J,* leaf with stipules; *K,* pinnately compound leaf; *L,* palmately compound leaf.

encumbered the descriptive literature with a correspondingly formidable array of terms, expressing often merely shades of difference in form and other features. While exceedingly variable in some plants and more or less inconstant in all, they nevertheless are employed largely in fixing identity and as the most commonly available parts deserve close attention in a description.

The primary function of leaves is a nutritive one, the building of food through exposure to sunlight. To this end they usually present an expansion of surface, exposed as advantageously as possible, and in extent of superficial area adjusted to conditions in the environment, such as available moisture, atmospheric humidity, intensity of light, and other factors. However, few general statements can be made concerning them which have not their numerous exceptions. The most common type of leaf is differentiated into a thin, expanded portion, the *blade,* and a stalk, or *petiole.* When the latter is lacking the leaf is *sessile.* The blade is commonly traversed by a primary vein, *midrib,* continuing from the petiole to the apex, and numerous secondary *veins* and intersecting *veinlets.* The course of the veins in a leaf is the *venation.* It is characteristic of the Monocotyledons that the principal veins of the leaf extend from the base of the blade to its apex, with comparatively few intersecting veinlets, and the leaf is said to be *parallel*-veined; in the Dicotyledons the secondary veins do not extend from base to apex, and the veinlets intersect freely, resulting in the *netted* type of venation. When the secondary veins arise from the base and approach the apex the leaf is *nerved;* when they diverge like the rays of a fan the venation is *palmate,* and when they are distributed along the midrib on either side it is *pinnate,* feather-

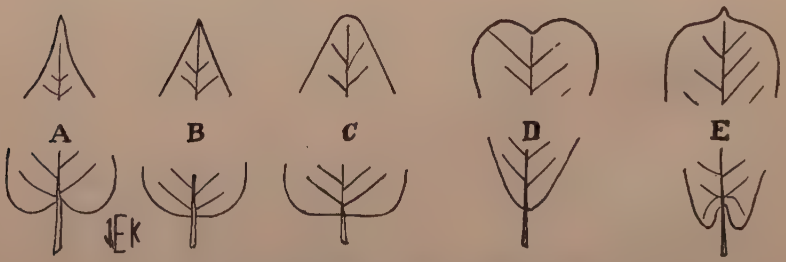

FIG. 86.—Forms of leaf base and apex

A, acuminate (taper-pointed) apex and cordate base; *B,* acute apex and rounded base; *C,* obtuse apex and truncate base; *D,* emarginate apex and wedge-shaped base; *E,* cuspidate apex and auriculate base.

like. When divided to the midrib the blade is *compound,* otherwise it is *simple,* and may be *lobed,* or *cleft.* The division or lobing of a leaf conforms to the venation and is palmate or pinnate. The blade is *entire* when the margin is without teeth or divisions of any kind; it is *dentate* when set with pointed teeth, *serrate* when the teeth are pointed forward, *crenate* when they are rounded, and *undulate* when the margin is wavy. When the surface of a blade is smooth it is *glabrous;* when hairy, *pubescent.* Various degrees and kinds of pubescence are recognized, but the special terms applying to these have not been employed in this text; for them, consult botanical manuals. When the margin is beset with a fringe of hairs it is said to be *ciliate.* As the hairs are often fine and short, invisible to the naked eye, and their presence or absence a specific character, it becomes necessary usually to resort to a pocket lens to adjudge this feature.

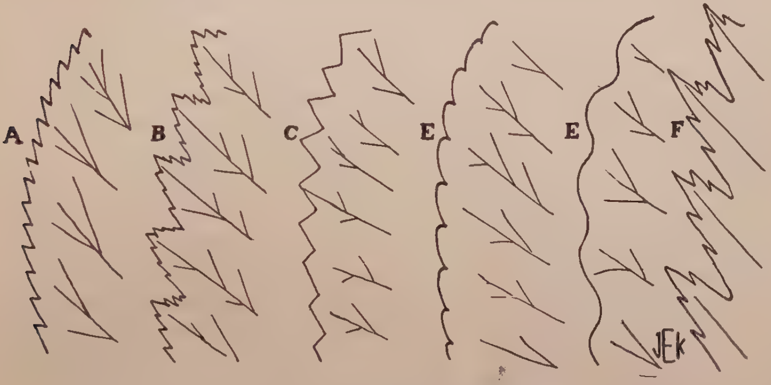

Fig. 87.—Margins of leaves

A, serrate; *B,* doubly serrate; *C,* dentate; *D,* crenate; *E.* sinuate; *F,* cut or incised.

The forms of leaves are most often described as *rotund* or *orbicular* when approaching the circular in outline; *cordate,* heart-shaped; *obcordate,* when the wider part is near the apex, reversed; *ovate,* in outline like a longitudinal section of a hen's egg; *obovate,* reversed ovate; *lanceolate,* shaped like the head of a lance; *oblanceolate,* reversed lanceolate; *oval,* broadly elliptic; *oblong,* longer than broad, the sides nearly parallel; *linear,* narrow, many times longer than broad.

Stipules are characteristically present with the leaves of some families. They are two small, lateral appendages at the base of the petiole, sometimes persistent and conspicuous, as in the Roses, often ephemeral and minute, as in some of the Willows. The terminology of the leaves as to form, margin, and surface is applied also to the description of the stipules.

The Stem.—The features of the stem most important in the classification of plants are internal, in the organization and structure of the vascular tissues. In the woody stems of the Gymnosperms no true vessels are present in the wood, which is composed of closed cells, and does not show the porous structure evident in a transverse section of Maple, Birch, or Oak. In all Angiosperms the wood contains ducts or tubular passage ways for the sap. The structural organization, however, needs seldom to be called into account in identifying our trees or shrubs, other and more conspicuous characters usually being sufficient.

The surface of the stem as to pubescence, color, scars, and other markings is usually a matter of specific interest, but calls for few technical terms. While the arrangement of the twigs, conforming more or less to leaf position, as opposite or alternate (Maples, Hawthorns), may be characteristic of the species, genus, or family, the erect, spreading, or creeping attitude of the branches, though usually specific, may often be induced by conditions of the environment. Modifications of habit which are purely ecological appear in the forms of trees at timberline, or in places exposed to severe winds, heat, or drouth, or in crowded or shaded conditions. As the classification of plants is based upon their structural features, it is important that one should arrive at a just appreciation of their relative values. It must be borne in mind that few if any of the structures above discussed are absolutely constant either in numbers or in form. The organs of a flower will vary in number, size, shape, color, and the position of the flowers on the plant will vary. The leaves of the same plant will be found to vary in size, ratio of length to breadth, margin, surface, texture, and other characters. Similarly stems, fruits, and seeds vary. Almost the only invariable rule among plants is that all their characteristics are variable. But this variation appears as fluctuation about a mean of length, form, numbers, color, etc. Its extent is far greater in some species than in others, and has led to much confusion and conflict of opinion in the classification. While the tendency to variation is innate in living organisms and is apparently useful in providing a measure of plasticity under conditions of the environment, by the same token it appears that the environment accentuates the variations, as shown by the experimental studies on the marked effects of a wide range of physical and chemical agents on form and structure. It is true, however, that some organs are far more constant than others, representing structures of longer standing and less susceptibility to outside influences, and such are accepted as having greater value in fixing relationships. Thus the reproductive organs are more stable, or in other words less variable, than are the vegetative tissues and organs, which feel the full force of any changes occurring in those conditions essential to the performance of their work.

Therefore a careful study of the conditions under which plants, assumed, because of certain differences, to be distinct species, may be growing and also a study of the susceptibility of the plants in question to changes in these conditions should be of service in evaluating their differences in structure. Such differences are usually inconstant and even less marked than may appear between parts of the same plant. Hence it is often hazardous to assume specific difference upon the basis of specimens plucked and compared apart from their sources, as may be shown by the comparison of leaves and other organs taken from the same plant. Conspicuous instances of this kind may be cited in some of the Willows, Oaks, and Hawthorns, in which leaves widely differing in form, margin, color, pubescence, and stipules may be found on different branches of the same tree. One may find sometimes on the same Willow three distinct types of leaf which if viewed apart might easily be regarded as belonging to totally different species: there are those on sucker-shoots with large blades, coarsely veined and pubescent, and broad, persistent stipules; those on the sterile shoots of the older stems, smaller, thinner, smooth, and differing in outline; and still others on fertile shoots, without stipules and with other modifications of the essential features.

Authors differ in their views as to the degree of difference in plants which should justify specific distinction, but most are agreed that the differences, whatever they are, should be constant in fact, i.e., fluctuating about a different mean. No exact definition as to what constitutes a species has yet been established, and perhaps never may be, but it is hardly possible to bestow the permanency of a specific position in the literature upon a plant which has no real or innate permanency of its own in nature, or which in other words is induced and sustained by a set of external conditions.

A natural system of classification of plants is an attempt to express the relationships existing among them, from the standpoint of descent and inheritance. In this light structures are interpreted and applied in the grouping of plants into genera, families, and other divisions, indicating near or remote connections. A well-known writer has likened the genus to an archipelago, in which the islands represent the species of which the genus is composed. The width of the channels between the islands represents the degree of visible difference between the species, but their depth the constancy of the differences. Continuing this comparison it is evident that wide channels may be very shallow and the lands separated by them even doubtfully distinct by the presence of spits and bars; on the other hand, the narrow channels may be very deep and of long standing. And as by continued exploration and soundings the relations existing between the parts of an archipelago may become more exactly known, so the true relation between the members of a genus must be established, not upon their apparent differences in a narrow geographical range, but upon the evidence afforded by the group in its totality, gathered from all the known limits of its distribution.

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